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JAN. 2, 1913

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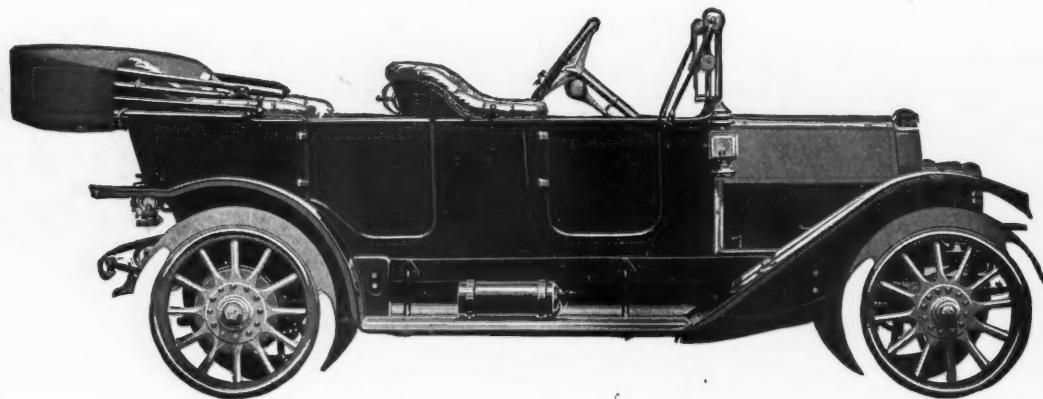
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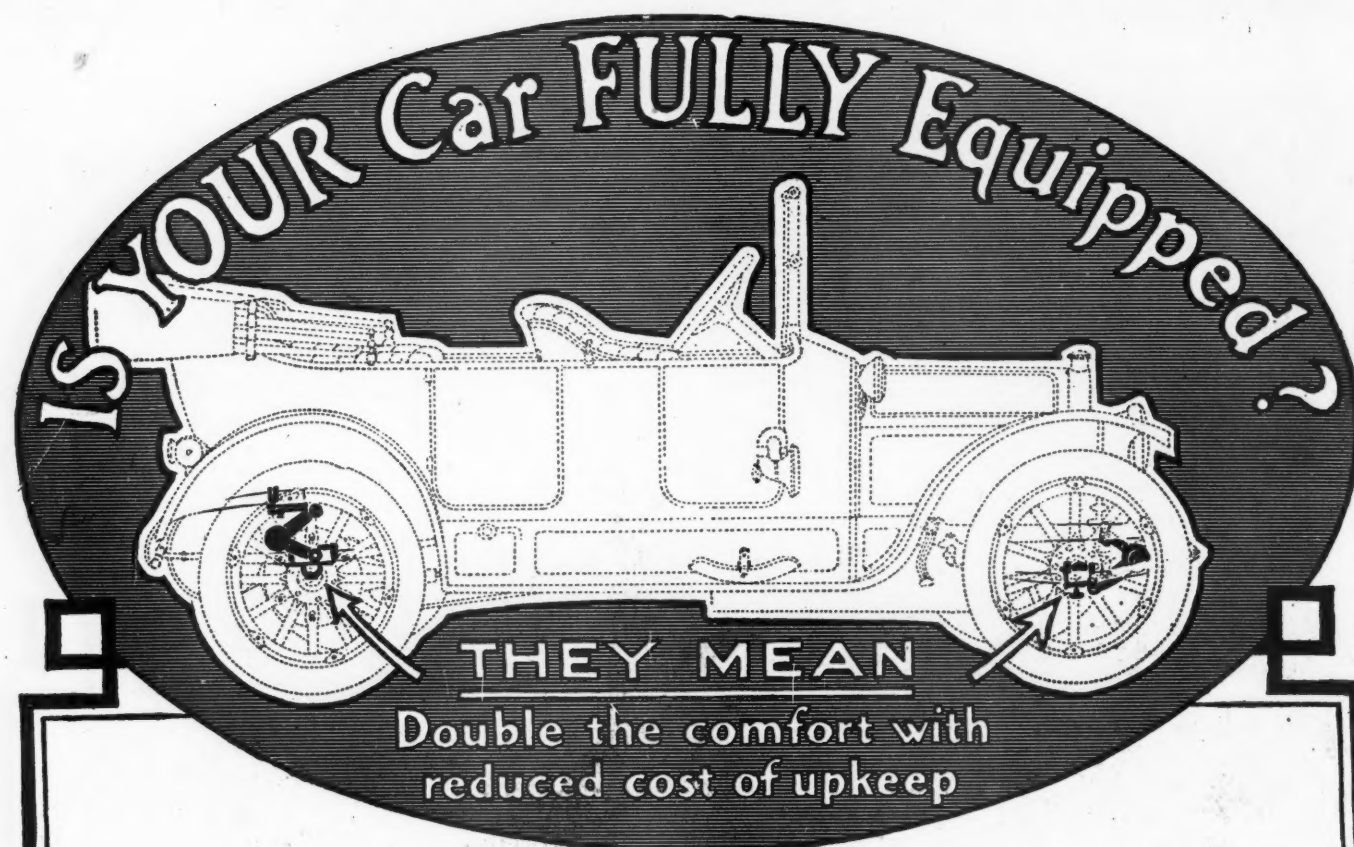
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Published by the
CLASS JOURNAL COMPANY
910 South Michigan Avenue
CHICAGO ILLINOIS

Volume XXIII

JANUARY 2, 1913

No. 1

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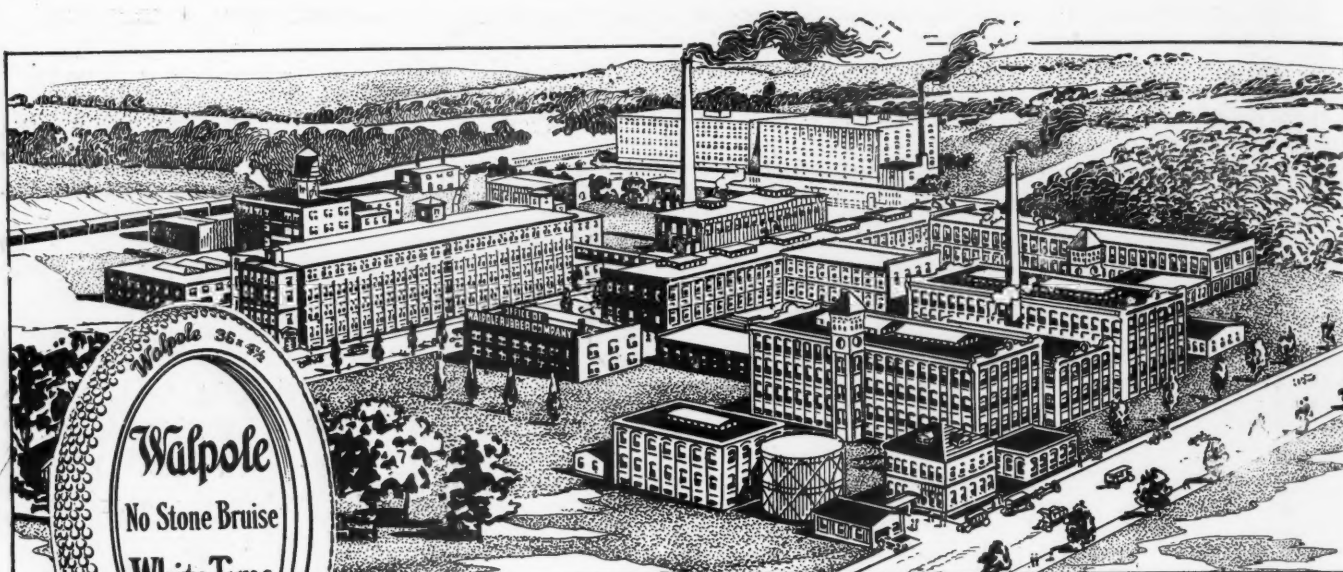
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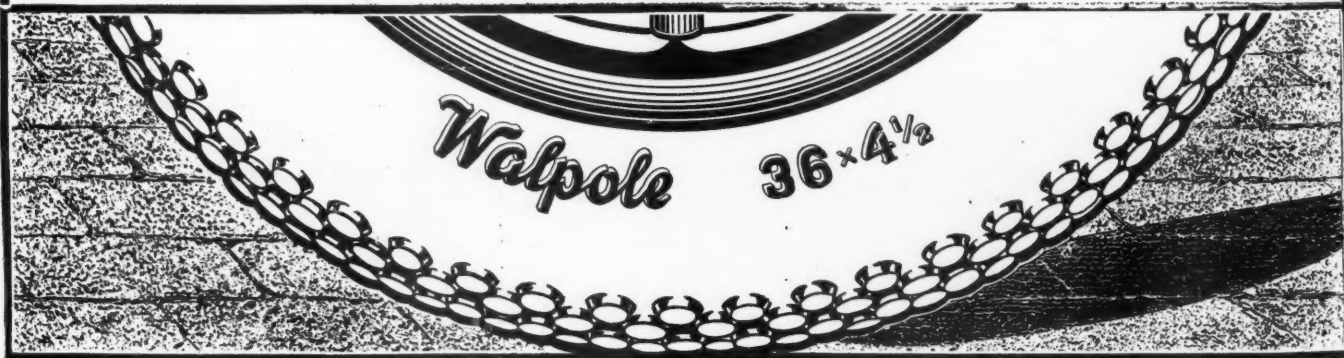
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MOTOR AGE

Electric Progress

Pleasure Cars for 1913 Have Larger and More Luxurious Bodies— Prices a Little Higher

*Commercials Have Larger Carrying Capacity—Multiplicity
of Models—Larger Carrying Capacity*

By David Beecroft

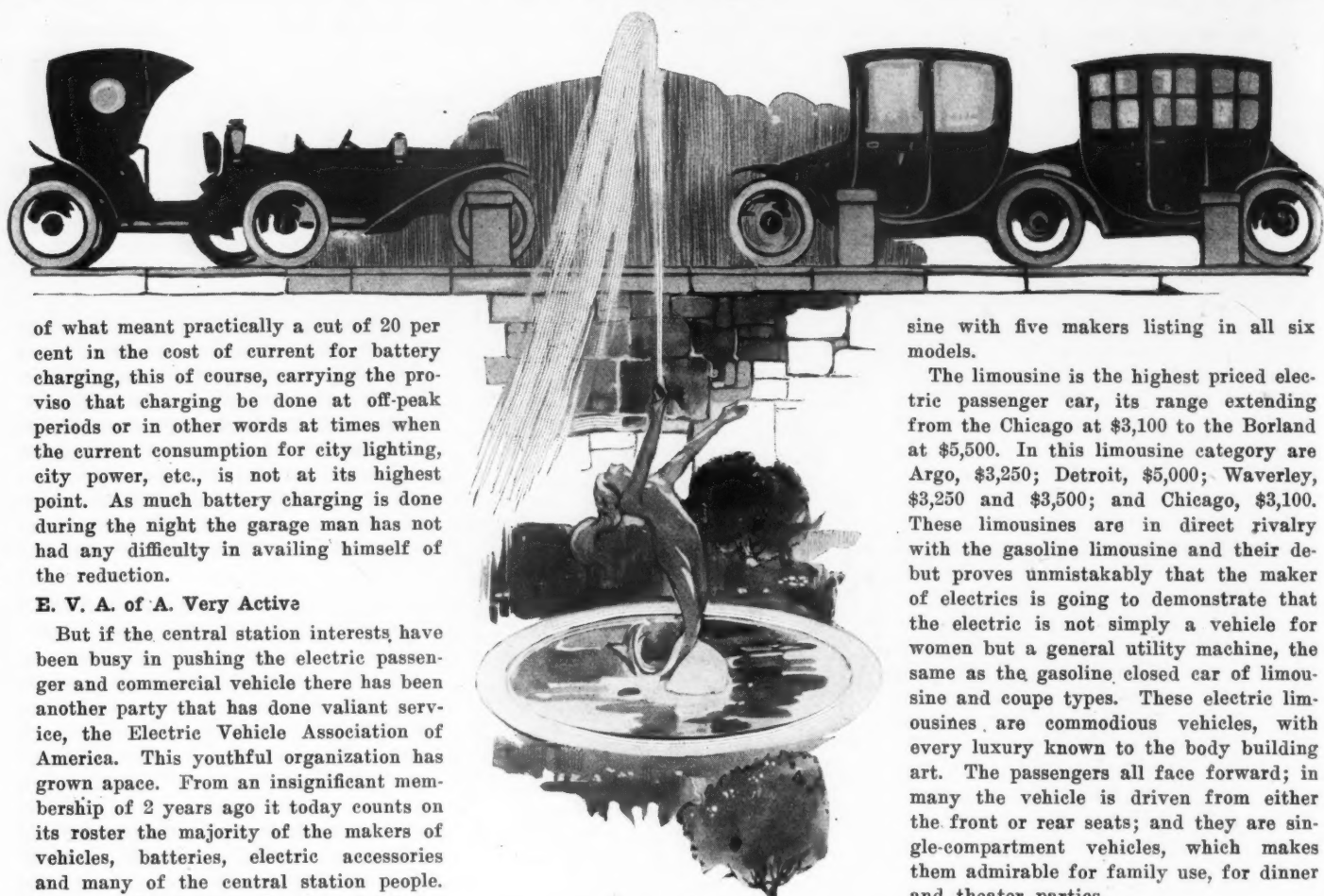
ELECTRIC passenger cars for this year carry larger and more luxurious bodies than last year. The prices also are a little higher, but all considered, the buyer is getting more for his money than formerly.

Electric commercial cars are built in a greater multiplicity of models and generally the models added are of larger carrying capacity. There are now five or six makers listing 5-ton vehicles, not a few manufacturing 4-ton machines and the number of manufacturers building 3 and 3.5-ton machines has increased considerably.

These two paragraphs summarize the progress of the year in these two respects, but there have been other avenues of progress in the electric vehicle industry during the last 12 months that count almost as much, if not more, for the general advancement of the industry as the mechanical improvements in the vehicles and the body refinements. Foremost comes the get-together spirit of the maker of vehicles, battery makers, and every other maker of articles in every city which manufacture electric current for lighting, fuel, power and battery charging.

These central station people have been very active, exceedingly so. For years they were asleep, inexcusable Rip Van Winkles. But they awakened after the continual efforts of the electric maker and now that they have opened their eyes after a sleep of years, so far as battery charging for vehicles is concerned, they have started in real earnest and are setting the pace for the vehicle and battery makers. These central station people have awakened because it is putting money in their pockets to get out of Sleep Hollow. They have learned that one 5-ton truck will consume as much current as a block of city residences. They have discovered the value of the electric and are today proclaiming the vehicle from the house tops and metaphorically are going out into the highways and byways and compelling the customers to come in.

But these central station people are playing fair. They are cutting the price of electric current and establishing varying rates which is proving popular in the majority of centers. In Chicago announcement was made during the year just closed



of what meant practically a cut of 20 per cent in the cost of current for battery charging, this of course, carrying the proviso that charging be done at off-peak periods or in other words at times when the current consumption for city lighting, city power, etc., is not at its highest point. As much battery charging is done during the night the garage man has not had any difficulty in availing himself of the reduction.

E. V. A. of A. Very Active

But if the central station interests have been busy in pushing the electric passenger and commercial vehicle there has been another party that has done valiant service, the Electric Vehicle Association of America. This youthful organization has grown apace. From an insignificant membership of 2 years ago it today counts on its roster the majority of the makers of vehicles, batteries, electric accessories and many of the central station people. It was really the drum beating of this juvenile that broke the slumbers of the central station crowd.

Lower Insurance Rates Secured

Today the Electric Vehicle Association of America is working double shifts and doing much overtime service. It is widespread in its work. Besides interesting the central station people and getting them to cut their rates, it has approached the insurance companies and has got reductions in rates so that now the rates on electrics are approximately one-half that on gasoline vehicles. But it has gone further: Standardization of parts in the electric has been one of its hobbies and today it has practically standardized charging plugs, a boon to owners of both passenger and commercial vehicles; it is aiming to standardize vehicle speeds; it has recommended the adoption of a standard sign for battery charging stations; the question of standardizing lamps is being vigorously pushed; and in addition to this it has brought about co-operation of makers, central station interests, battery interests and others in nation-wide advertising campaigns for the benefit of the electric. It has done more: By working for the establishment of electric garages it is doing one of the greatest works for the more speedy introduction of the electric passenger and commercial vehicle.

But space will not permit of digressing still further on the good that this organization has accomplished. It has instituted its annual convention, where makers con-

gregate, listen to papers read and discussed, and formulate plans for greater aggression. To get closer to the people it is organizing its branches, or local divisions, in the leading cities and each in its respective circle is putting its shoulder to the wheel and helping on the nationwide movement of bringing the electric vehicle into its own.

New Faces Appear

Returning to the electric passenger vehicles for this year: The number of concerns building them is a little larger than a year ago. Among the new names are the Chicago and the Buffalo, the latter being the successor of the Babcock. The specification on other pages in this issue enumerate two-dozen makers and there are a few not included therein. One or two companies have announced they are discontinuing their electric passenger vehicles and centering all of their attention on their gasoline lines.

Closed Bodies the Trend

Most marked in the passenger vehicle field is the increased number of closed bodies listed, and the practical elimination of the stanhope and victoria styles. The closed types include the coupe, the brougham and the limousine, which has really made its initial bow, being listed by not fewer than five of the leading makers. The brougham leads the field of closed types, with twenty-seven different models. Next comes the coupe with fifteen listed models; and lastly the limou-

sine with five makers listing in all six models.

The limousine is the highest priced electric passenger car, its range extending from the Chicago at \$3,100 to the Borland at \$5,500. In this limousine category are Argo, \$3,250; Detroit, \$5,000; Waverley, \$3,250 and \$3,500; and Chicago, \$3,100. These limousines are in direct rivalry with the gasoline limousine and their debut proves unmistakably that the maker of electrics is going to demonstrate that the electric is not simply a vehicle for women but a general utility machine, the same as the gasoline closed car of limousine and coupe types. These electric limousines are commodious vehicles, with every luxury known to the body building art. The passengers all face forward; in many the vehicle is driven from either the front or rear seats; and they are single-compartment vehicles, which makes them admirable for family use, for dinner and theater parties.

Vogue of the Brougham

The brougham is a slightly lower priced vehicle than the limousine, its figures ranging from \$2,500 to \$3,500, with the majority around \$2,800, \$2,900 and \$3,000. Nine different makers list brougham models and many of them list several different brougham types, such as Woods, with four models; Waverley, three models; Rauch & Lang, five models; and Detroit, four models. The reason for this multiplicity of models is that the body designs vary; thus one maker will show a colonial brougham, a standard brougham, a demi-brougham and a convertible-brougham, with different prices on each. It is almost impossible to define the body differences according to the differences in nomenclature.

The Colonial Type

Lastly, in the closed body field is the coupe, which has increased in favor and is how firmly established as a small inclosed model. The strict colonial type has progressed, so that now the accentuated curved top, characteristic of this type, is quite general with many of the makers. It makes a specially smart appearing vehicle. Coupe prices rarely reach the \$3,000 mark but hover between \$2,500 and \$2,800. One maker lists a model at \$1,885, which is practically the only electric of the year listed under \$2,000. Fifteen different makers are listing coupe types.

The roadster or runabout has the open vehicle field to itself and today this type

of vehicle is recognized not as an outburst of company radicalisms but as a standard model. Eleven makers are marketing them and of this number two concerns have a couple of models each. The electric roadster is using the curved hood or bonnet in preference to the imitation of the gasoline hood. A few still continue the use of the false radiator and other imitations. The feeling is gaining ground that the electric roadster can stand on its own feet; that it has a legitimate place and that it will soon, as a city vehicle, become considered as seriously for general utility purposes as the gasoline roadster. Runabout prices hold close to \$2,500, with one or two getting as low as \$2,250 and others climbing to \$2,600 and \$2,800. The steering wheel is popular on this type. Among the concerns listing roadsters are Argo, Borland, Buffalo, Columbus, Church-Fields, Detroit, Rauch & Lang, Waverley, Woods, Fritchlie and Electra.

Wheelbase Lengthened

Forgetting for the moment the body and looking at the chassis, a rather unknown factor in some electrics, it is seen that engineers have been busy so that now the glib-tongued salesman can talk chassis mechanics to the male buyer as well as his cousin salesman disposing of gasoline machines. Wheelbases are longer; this is due to larger bodies such as limousines and bigger brougham designs. The Borland limousine wheelbase is 123 inches, a full-grown gasoline vehicle measurement. The more general dimensions are 100 to 110 inches for this body type. For broughams 92 and 96 are popular lengths but a few bodies for all facing-forward are from 100 to 110 inches. Argo and Waverley use specially long wheelbases on all of their models. For roadsters 90 to 92 inches is the general average.

Wide Options on Tires

Makers are giving the widest options on tires, fourteen, or over one-half the companies, putting tires in the optional column. Cushion tires are listed exclusively by Grinnell and Chicago; and on parts of the models by Waverley and Woods. Pneumatics are listed exclusively by Bailey, Baker, Buffalo, Dayton, Flanders, Hupp-Yeats, and Standard. Solid tires are listed on some models by Borland and Woods. So great is the variation in tires listed that it is quite impossible to draw definite conclusions. Different conditions of

streets in different cities are factors in determining the tire equipment.

Shaft drive is gaining, in fact there are not over a couple of concerns that are today listing chain-driven models. The motor is generally mounted under the center of the body, or as is the case with a few immediately in front of the back axle and a unit with it. Where the motor is separate from the axle a propeller shaft with or without universal joints is used.

Gear Reductions

Several makers continue to use two gear reductions between the motor and axle, but the tendency is to use but a single reduction of say 4 to 1 or 5 to 1 and make this between the bevel pinion and differential in the axle. In differentiating between a single reduction and two reductions it is accepted practice to designate the vehicle with one reduction as having direct shaft drive the same as in the gasoline vehicle field, in contrast with the other class designated shaft drive with reductions.

Hupp-Yeats, Argo and Flanders mount the motor as a unit with the axle and so eliminate the drive shaft entirely. Each has but a single gear reduction between the motor and the differential. Flanders uses a worm-driven axle, the others bevel driven. Some concerns, in which the motor is not a unit with the rear axle and in which there is but a single gear reduction between the motor and the axle, are: Detroit, 5 to 1 reduction; Chicago, 5 1/13 to 1; Buffalo, 4 to 1; Grinnell, 4 1/4 to 1; Ohio, 4 to 1; and there may be others, but information is not available on them.

Placing Reductions

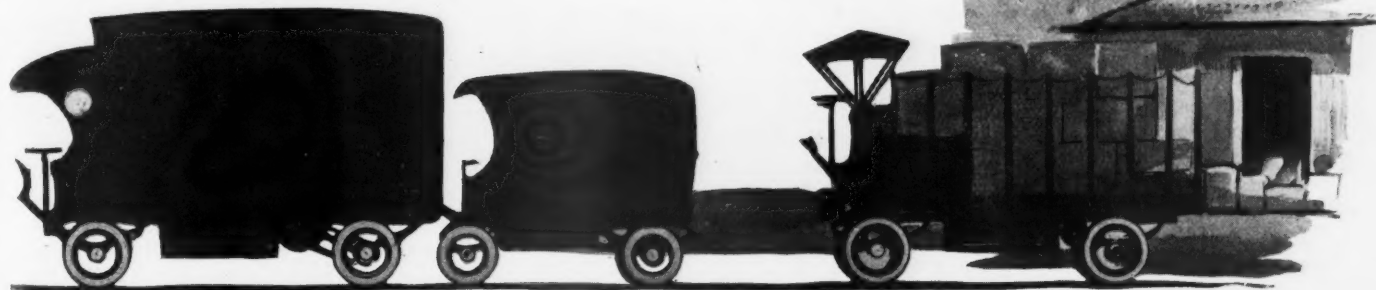
Where two reductions are used it is conventional practice to place one between the motor, or armature shaft, and the propeller shaft; and the other in the axle. Silent chain and herringbone gears are the most popular for reduction between the motor and the propeller shaft; and bevel pinion and gear in the axle. In the Standard the two reductions are in the axle, one by spur and the other by bevel.

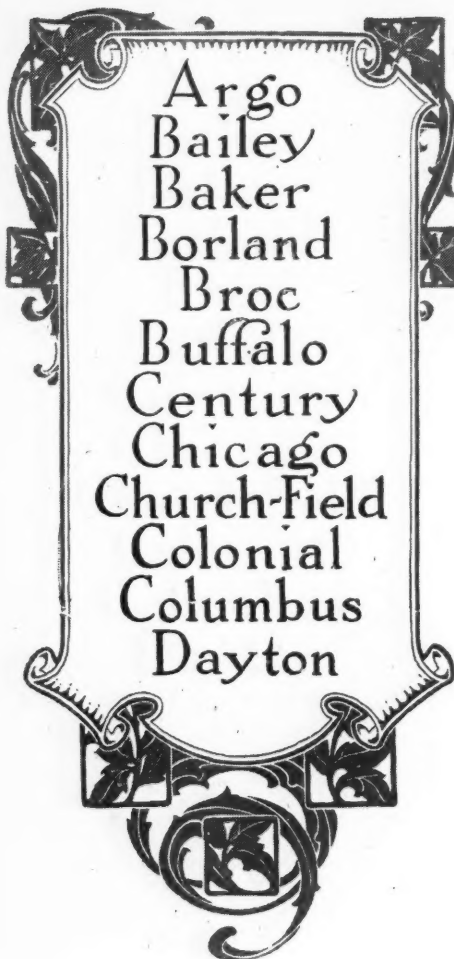
The I-beam front axle has made marked gains; the dropped frame is working at its debut; three-quarter elliptic springs are receiving attention; and wire wheels are exhibited by a few enterprising makers.

In a cursory glance at commercial elec-

tries a few trends appear in addition to the major one of marketing larger-carrying-capacity models. Chain drive continues in the van but the aggressiveness of bevel and worm exponents in the gasoline field is evidencing itself in the electrics. Worm drive is fitted on two models of the Commercial truck, bevel on the Argo and Waverley; spur on four Commercial Truck models; and internal gear on five Walker models in which the motor is incorporated in the axle housing. The Couple Gear uses the motor within the wheel. Baker on its new 3.5-ton model incloses the driving chains so that they operate in an oil bath. In a word, inclosed drive, in one form or another, is asserting itself as forcibly as in the gasoline field.

Manufacturers of commercial electric vehicles are striving to give the business world as much for the money as possible. It is noticeable this year that carrying space has been increased as much as possible, conducive with sound mechanical ideas, and that the education of the employer as well as the driver in the care of the machine is being pushed with vigor, to the benefit of both maker and buyer.





As Fashion Says

dising on a sounder and more rational basis. Lastly, the central stations, the purveyors of the indispensable heart's blood of the machine, have awakened to the benefits accruing to themselves by the wholesale market for electricity in the crude, opened up by the electric carriage and truck.

Improving Mechanical Details

Designers have gotten away from the toy-like productions of the past, and are building not only larger and more luxurious vehicles, better fit for the street and road-way as well as for the boulevard, but there is a noticeable tendency among the majority of builders to bring the cars closer to the ground, and to increase the size of wheels. The road clearance has not been lowered, however, in the process, but with the lowest parts remaining stationary, the other portions of the vehicle have been brought down to their level, with the result of increased grace of contour, enhanced ease of riding, greater stability and a wider margin of safety.

Greater refinement is to be noticed in the design of mechanical details, tending to lessened friction, improve the balance, lessen sound, and give greater convenience of control, and higher efficiency. Body types have been greatly beautified, the unsightly angles and excessive decoration of the panels having given place to smooth flush sides, impressing one with grace of intrinsic form and proportion, rather than of gaudy decoration. Accessories have undergone changes in appearance, being now integral parts of the car, unobtrusively countersunk in its panels, and not attached by a multiplicity of bolts and screws, each of its own type.

New Body Types Offered

Among the new body types, the front-facing brougham, often termed limousine, is prominent. Various and ingenious are the seating arrangements, some with a single seat in the rear for two or three persons, a stationary seat forward for the driver, and a revolving auxiliary chair; others with movable control units, so that the car may be controlled from either the front or rear seat, others with four individual chairs, and still others with full-fledged limousines and berlines. The conventional brougham, with facing seats, is still in evidence, as is the single-seated coupe. Open bodies seem to be coming back into popularity.

Standardization has now become the rule with electric builders. Charging plugs will in future be uniform, so that the owner

of an electric vehicle may have it charged at any charging station; wheelbases are settling down to a standard of about 96 inches, which simplifies manufacture and enables garage builders to allow for storage space with a reasonable amount of accuracy, and perhaps more significant than either of these is the standardization of batteries. Forty-cell batteries, divided in two trays seem to be standard with the majority of builders. S. A. E. standards are followed in mechanical details by most builders.

Dissension and internal stress in electric vehicle trade circles seems to be disappearing, thanks to the efforts of the Electric Vehicle Association of America. Makers and dealers alike have recognized that negative sales and advertising methods, disparaging of each other's practices result in the instillation of distrust in the minds of buyers.

Central Station Men Help

By means of cooperation, much of mutual benefit has been accomplished. Not the least of these accomplishments is the winning over of the central station men, who, formerly blind to the opportunity offered by them, now recognize the electric vehicle, where prevalent, as the source of their greatest income, proportionate with the investment required. In pursuance of these facts, central stations are beginning to realize the advertising and profitable moral effect of replacing their own horses with electric cars, to say nothing of the inherent economy of the power vehicle.

But the development of the electric has not been entirely a moral one. New territory has been entered, and a remarkable growth has been made by the industry in the past year, and particularly in the last 6 months. In round numbers, 10,000 electric cars were built in 1912, of which number 6,000 were pleasure cars, and 4,000 trucks. This production is about one-third of all electrics now in service in this country. There is a slight increase in the proportion of commercial electrics, as it is estimated that of the present 30,000 electric vehicles in the United States, 10,000 are of the commercial type.

Output Greatly Increased

The 1912 output represents a 125 percent increase in numbers over the output of 1911 and the year previous. It is predicted for 1913 that the increase will be still more acute, and it is not too much to believe that the dawn of 1914 will see 30,000 electric pleasure cars and 15,000 commercials added

By M. C. Horine

AROUSED to the possibilities of future conquests, the electric vehicle business is an awakening giant. A little brother to the immense industry that gasoline motor car building has become, the electric vehicle business has gradually risen from obscurity to a position of real significance in the commercial world.

This has not been due solely to the tireless efforts of designers, to the ceaseless toil of the builders, nor to the ingenuity and enterprise of the salesmen. The manufacturer has, by careful management, judicious buying, and systematization of factory processes, succeeded in introducing economy into the production, materially cutting the price to the consumer, and bringing electric vehicles within the reach of a greater number of people. The advertiser, by a two-sided study of both the needs of the purchaser and the lore of the engineer, has conducted campaigns of educational advertising that have kept the public posted as to the progress of the business.

Growth of the Industry

Associations, formed for the mutual benefit of all parties interested, have enabled competing manufacturers to co-operate to the benefit of all, and to establish standards that greatly enhance the field of utility of the electric vehicle, facilitate its maintenance and repair, and place their merchan-

They Should Be

to the number in use in America. The geographical distribution is not even, as the great majority of electric commercial trucks are in service east of the Alleghany mountains, while of the pleasure cars, Illinois, Ohio, Michigan, Minnesota, and California undoubtedly lead in the number in use.

ARGO

BUT one model of Argo pleasure cars is to appear for 1913. This will be provided with two bodies, the first a brougham and the second a roadster. The difference between this model and that of last year consist of the substitution of an I-beam front axle for the tubular type formerly used, the employment of radius rods in the propulsion to relieve the springs of driving stress, and minor refinements throughout.

A fore-drive feature is offered on the brougham models. On the fore-drive model the battery has been separated into two tiers, one being carried in a small projection at the rear, and the forward hood slightly raised. The same forty-cell battery is used on all models as formerly. Body types designated as model A have a passenger capacity of four, and those styled model B afford accommodations for five adults.

BAILEY

TWO body styles on two chassis are offered as the 1913 Bailey line, these styles consisting of a roadster and a victoria pheaton, called the Queen Victoria model. The former seats two passengers, while the latter seats three side by side. The wheelbase of the roadster is 106 inches, and that of the victoria is 82 inches. The distinctive Bailey features of low construction, wheel steer, and three-point suspension are retained as in former years. Pneumatic tires are used on both models, 32 by 3½ front and 33 by 4 rear on the roadster, and 34 by 3½ on the victoria. Edison batteries are used on both chassis, that of the roadster being of fifty-two plates, and of the victoria, fifty-four plates.

The front of the car is hung on a transverse semi-elliptic spring; the ends secured near the steering knuckles and the center to a ball-and-socket joint on the front of the frame, which is of steel-reinforced wood. The rear of the chassis is hung upon elliptic springs. This three-point suspension permits the displacement of the front axle as in passing over obstruc-

tions, without subjecting the frame to undue stresses.

The ball and socket is above the center of weight, which is quite low, so that in rounding curves the body tends to lean inwards, which constitutes a factor of safety. The floor is low, and the passage is wide, making entry and exit easy. Control is by a lever on the inclined steering wheel, and by a foot switch and brake. The front hood is given a graceful curve which reduces wind-resistance.

BAKER

FEATURES of especial interest in connection with the Baker electric for 1913 are the new body designs, a new controller, a new lighting arrangement, and a longer wheelbase on some of the models. Models VA and VAF are new forward-facing coupes, the first of this type that the Baker company has brought out. This model is provided with swivelled front seats which may face in any direction, the drive being from the rear seat. The body lines and design of this car are different from 1912. The car has a longer wheelbase, is lower and larger. A full limousine back is embodied in the design, that eliminates the ungainly square corner at the rear. An option of wheel or lever steer is offered, and the windshield is divided, permitting rain vision opposite the driver, with the other window closed.

The roof has been designed along French lines so water never is shed over the door, and a new step of metal wider than formerly is fitted. The new lighting arrangement consists of an arrangement whereby the dome light is lighted when the doors are open, but is switched off when the doors are closed. Provision is made, however, to permit it to be left lighted with the door closed, if desired. A new controller with a horizontal lever is used in the new model, which permits it to be folded out of the way, consumes no seat room, and is said to make accidental reversing impossible. In addition is a two-passenger victoria on a small chassis, continued from last year.

BORLAND

BORLAND electrics will appear in five models for 1913, model 41, the brougham of last year being the only continuation. Model 45 is a new model built on the same chassis as model 41, but being provided with a semi-colonial coupe body. Model 50 also is a new model, with chassis identical except for an increase of wheel-

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Rauch & Lang
Standard
Waverley
Woods

base from 93 inches to 96 inches, accommodating a large colonial coach body. Model 52 is mounted on the same chassis as the roadster type, while model 60 is an entirely new model, although built along the same lines as other types. It has a wheelbase of 123 inches. The characteristic Borland features are the same in all models, each of which uses shaft drive exclusively.

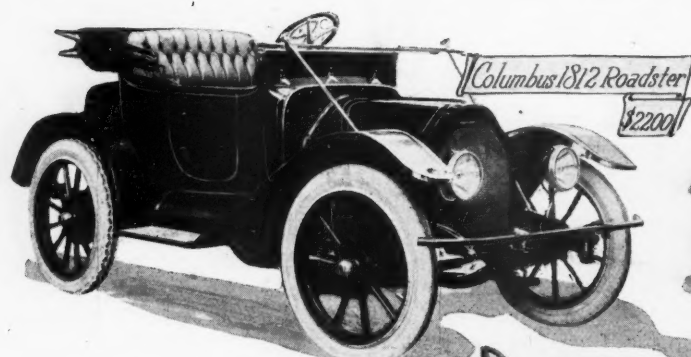
Tires are optional on models XLI and 45, Colonial broughams, while on model 41, the front-facing brougham, solids only are regularly provided. Model 60, the seven-passenger limousine, is equipped with pneumatics.

BROC

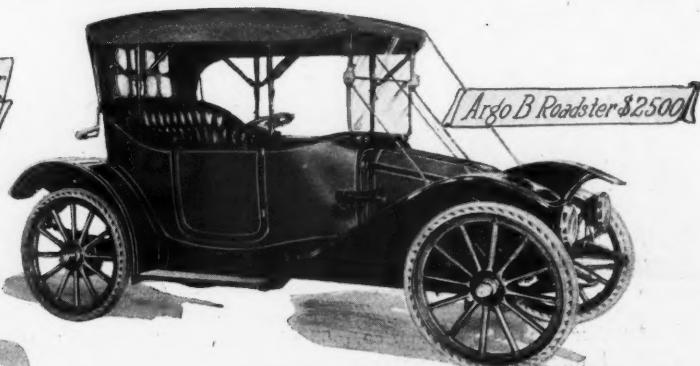
FIVE models will be produced by the Broc Electric Vehicle Co., model 20, a stanhope, model 21, a victoria, model 28, a standard type brougham, model 29, a front-facing brougham, and model 31, a forward drive brougham. Mechanical features remain practically unchanged from last year, the changes in the line being confined to small body refinements, the dropping of the roadster model and the six-passenger brougham, and the addition of model 31, in response to the demand for a front-drive car.

BUFFALO

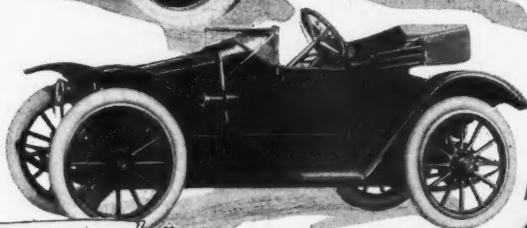
ONE of a number of cars which indicate in their design a growing tendency to emulate in the design of electrics the characteristics of gasoline vehicles, is



Columbus 1812 Roadster
\$2200



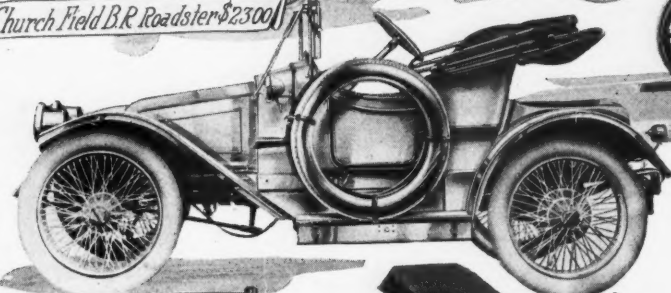
Argo B Roadster \$2500



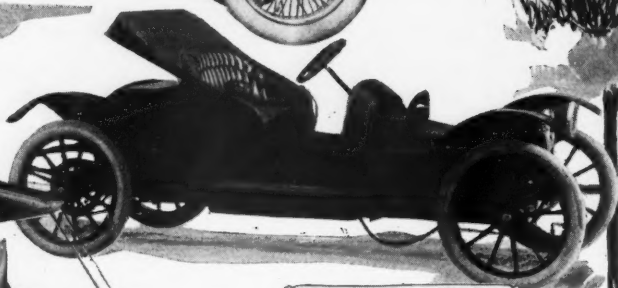
Church Field B.R. Roadster \$2300



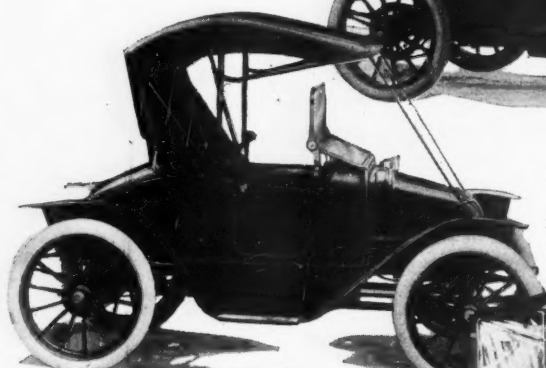
Woods 1319 Victoria \$2500



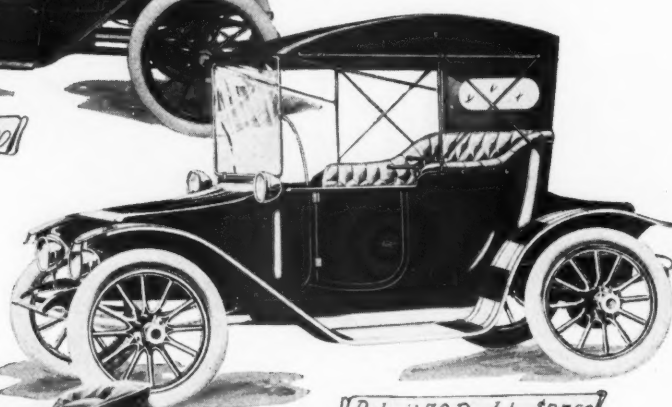
Buffalo 29 Roadster \$2500



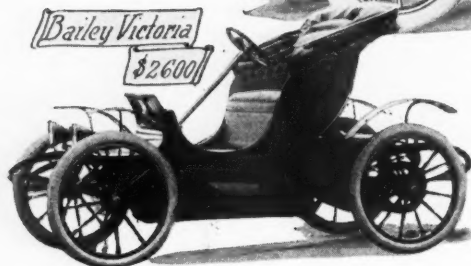
Bailey Roadster \$2500



Fritchle Brougham \$3600



Detroit 39 Roadster \$2350



Bailey Victoria
\$2600

the new Buffalo electric, which appears for the first time on the 1913 market. One chassis in two models is offered, in a roadster and brougham, respectively styled model 29 and model 30.

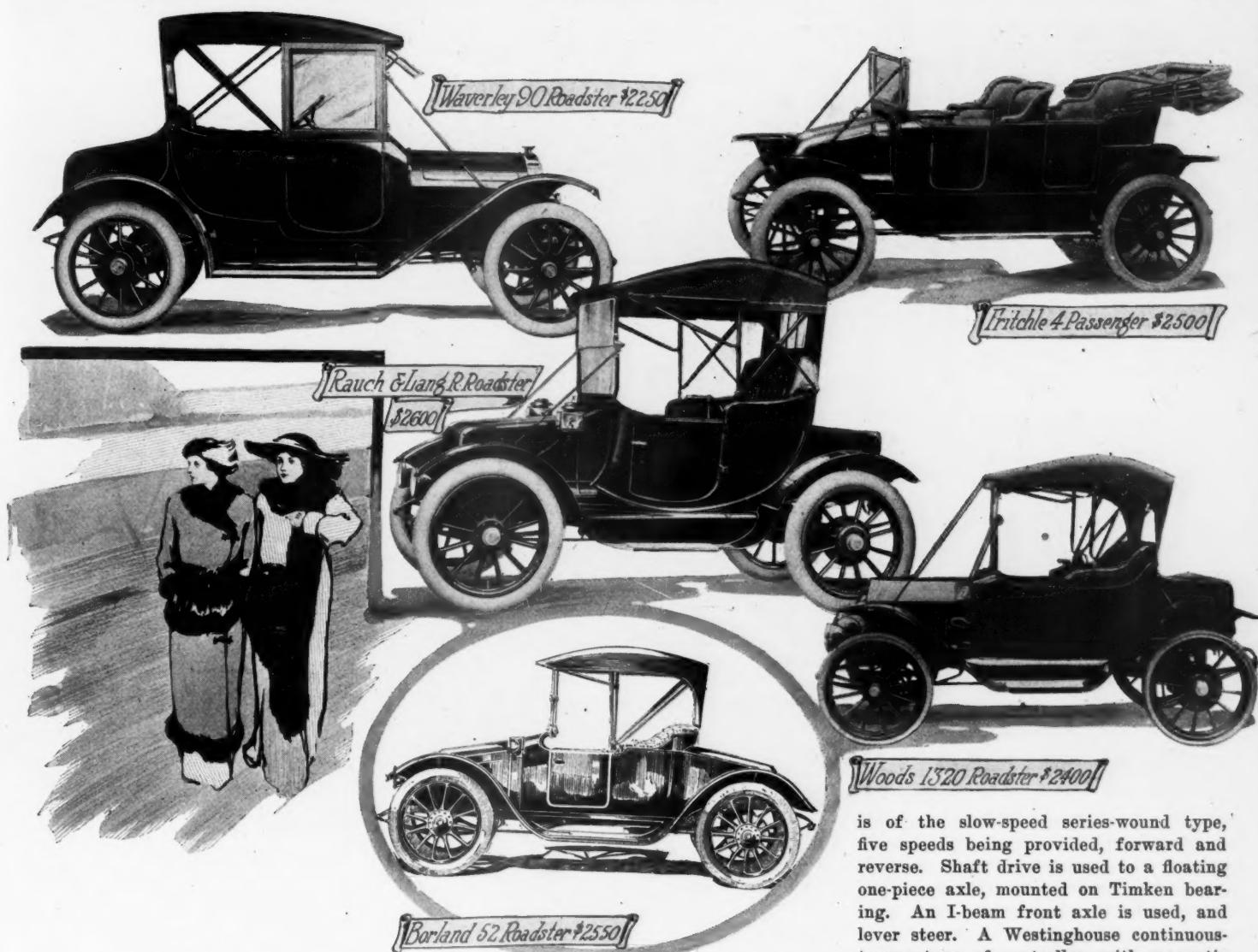
The general construction is very similar to that of a gasoline runabout of the latest type; a deep cowl shrouds the dash, merging into the body lines through the

medium of curved door tops; a practical windshield, full lamp equipment and a tire holder on the left running-board complete the equipment. The wheel and controls are a man's size.

The distinctive features are the sloping French hood, and the commodious tool boxes on the running boards. Wood wheels, with 34 by 4½ pneumatic tires, are regularly supplied on this car, but at an additional cost of \$100, wire wheels will be furnished. A forty-two-cell Philadelphia battery, carried in the hood forward and in a box at the rear, furnishes current for a motor of special design that is said to develop 20 horsepower. The drive from the motor is direct through a propeller shaft to the rear axle.

No universal joints are used, the motor, torsion tube and axle being a rigid unit, with the motor supported on flexible trunnions. An option of wheel or lever steer is offered, both types being irreversible. The control is by a controller handle, at the side of the driver, and a foot pedal which cuts off the power and sets the brake. The pedal operates the controller, high speed being the normal position, and





off being reached **just** before the brake takes hold, permitting coasting. Model 30 B is a special model brougham, with front drive.

CENTURY

MANUFACTURERS for 1913 are all trying to bring their centers of weight closer to the ground, and a contrast between the models shown at the 1913 shows with those of a few years ago will prove how universal is the trend towards greater stability. The Century electric, a Detroit product first introduced a year ago, has an underslung frame. This permits the door to be cut quite low, it permits ample headroom without raising the roof too much, and the manner in which the body nestles deep within the guards lends this car a grace all its own.

The car is built in liberal dimensions, and the low suspension permits the use of large wheels and high clearance. The frame is suspended from half-elliptic springs in front and platform springs aft, while the 36-inch wheels allow a 12-inch clearance. The wheelbase is 98 inches. The motor is suspended on a sub-frame, slightly forward of the car center,

and drives by shaft to the differential direct without secondary reduction. Thirty thirteen-plate oxide cells compose the battery, which is carried fore and aft. A feature of the body is a drop front windshield. The front axle is a straight tube, and the rear axle is of the floating type. A standard five-passenger brougham body is fitted to this chassis.

CHICAGO

THE Chicago electric is a newcomer, having appeared late in the 1912 season. The 1913 models are so very little different from the initial production of this car that such changes as have been made are not apparent. Two models are produced, model 132, with a front drive and accommodations for five, and model 131, with a rear seat drive seating five passengers. These cars are built to conform to the requirements of solid tires. They are identical in chassis features, with the single exception of wheelbase, model 131 having a 96-inch wheelbase, and model 132 a 104-inch wheelbase.

The battery is carried in front and behind in the usual manner, and consists of forty eleven-plate cells, said to be sufficient for 100 miles of travel. The motor

is of the slow-speed series-wound type, five speeds being provided, forward and reverse. Shaft drive is used to a floating one-piece axle, mounted on Timken bearing. An I-beam front axle is used, and lever steer. A Westinghouse continuous-torque type of controller, with magnetic blowout is used.

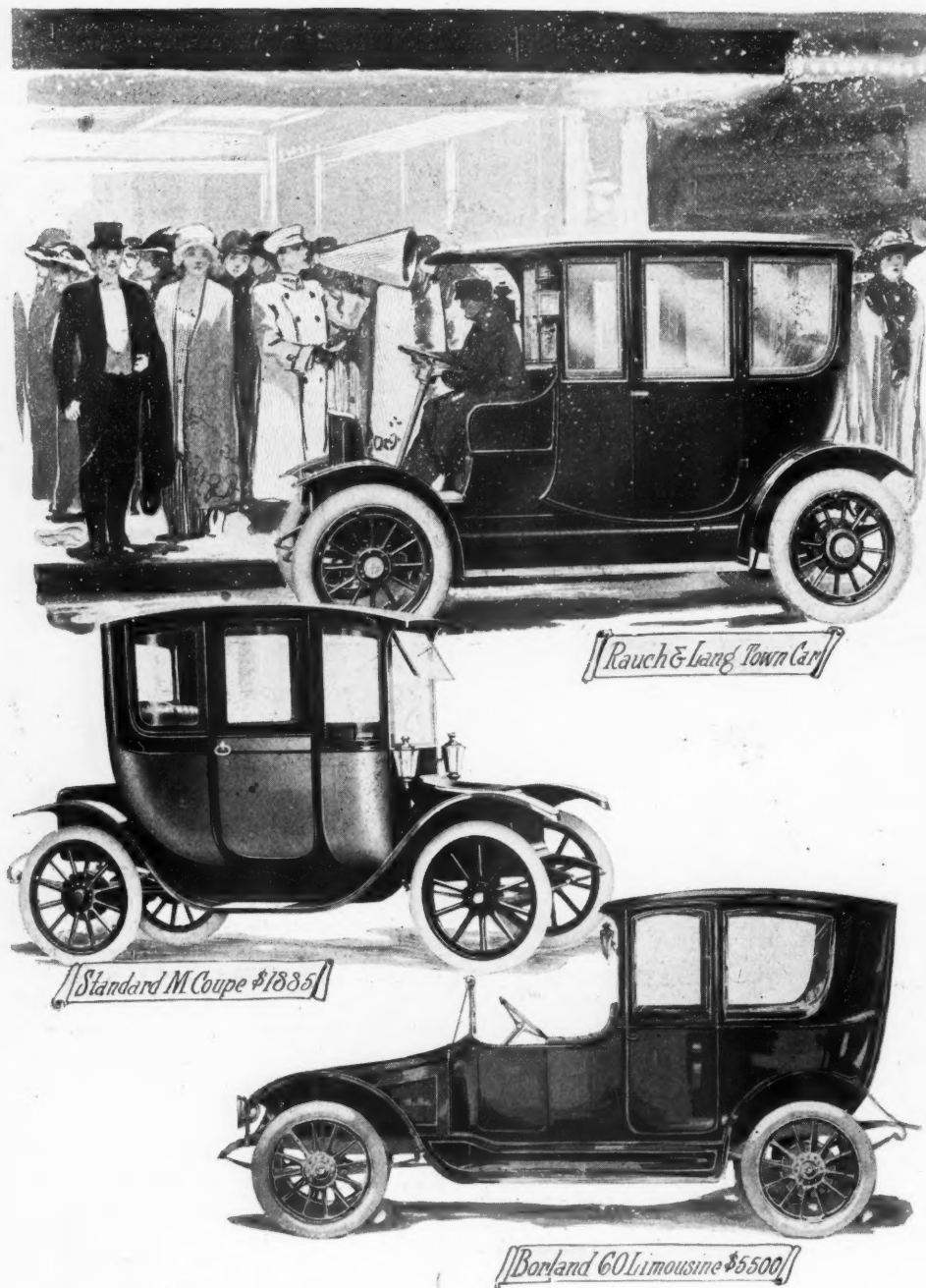
Bodies on Chicago electrics consist of a limousine in which the battery box has been eliminated, and a five-passenger brougham. The limousine is fitted with arched doors which provide additional head room, and drain the water to either side of the door in wet weather. Model 131 has its seats facing, and is very similar to the limousine, except that the drive is from the front seat in the latter. It is said that with a 104-inch wheelbase, model 132 may be turned in a 38-foot street.

COLONIAL

DETROIT has produced another electric of standard construction and medium price. This is the Colonial. One chassis of this car is produced, having a 93-inch wheelbase and 32 by 4-inch tires, elliptic rear springs and semi-elliptic front springs are used, and shaft drive to the floating axle. A five-passenger brougham body is fitted, which is specially arranged

COLUMBUS

COLUMBUS electric, model 1234, the latest design that has been introduced by the Columbus Buggy Co., is a four-passenger brougham, fitted with a corner



seat at the front to the left, opposite the driver, and a revolving seat on the right side. Model 1250 is built along colonial lines, all passengers facing forward, drive being from the left front seat. Both this and the new models are fitted with special motors of higher power than formerly provided, which are said to have increased the ability and mileage of the cars. Model 1230 is a two-passenger colonial coupe, and model 1218, a gentlemen's roadster. Model 1204 is an open stanhope with a seating capacity of four passengers, facing. The roadster appeals to the male user because of its resemblance to gasoline cars.

CHURCH-FIELD

DIFFERING radically from other electric cars in many respects, the Church-Field electric is offered for 1913 for the first time, having been introduced in 1912, but sufficiently late in the season to be

considered an advance 1913 production. Such changes as have been made subsequently are only in the nature of slight refinements.

This construction does not lower the clearance below that commonly allowed, although the center of weight is carried lower. This construction also permits straight-line drive.

The most distinctive feature of this car is its underslung frame, by which a low center of weight is achieved, and allowing the body to be carried high enough for a good view and cleanliness, without top-heaviness. The front of the chassis is suspended on semi-elliptic springs, while the rear spring is a special design of inverted elliptic spring, with the shorter leaves within the ellipse, which is claimed to produce, with the underslung suspension, great ease of riding, and to constitute in itself a shock absorber.

Another feature is a planetary gear-set, which makes it possible for this electric to negotiate hills and hard going in a low gear, without fear of burning out the windings, nor with an extravagant waste of current. Control of this car is by means of a controller on top of the steering wheel of the roadster and on the lever of the brougham, which provides ten speeds forward.

DETROIT

SOMETHING new is introduced in the electric field for 1913 by the Anderson Electric Car Co. in the form of the new clear-vision brougham models. Model 42 is the leader of this series. It is of the front-view four-passenger type, the walls being composed almost wholly of glass. The pillars at the front are of light steel, and very narrow, so that practically no obstruction to the vision is offered by them. The front windows are of curved glass, while the rounded corners at the rear quarters are also single panes of curved glass. The entire back wall is a single pane of glass. The driver's seat on this model is on the left side, in front, and is still sufficiently back to ride easily, and to preserve a balanced appearance, with only the driver riding. The roofs of the 1913 cars will be of aluminum, thus insuring them against leaking, and lightening them considerably.

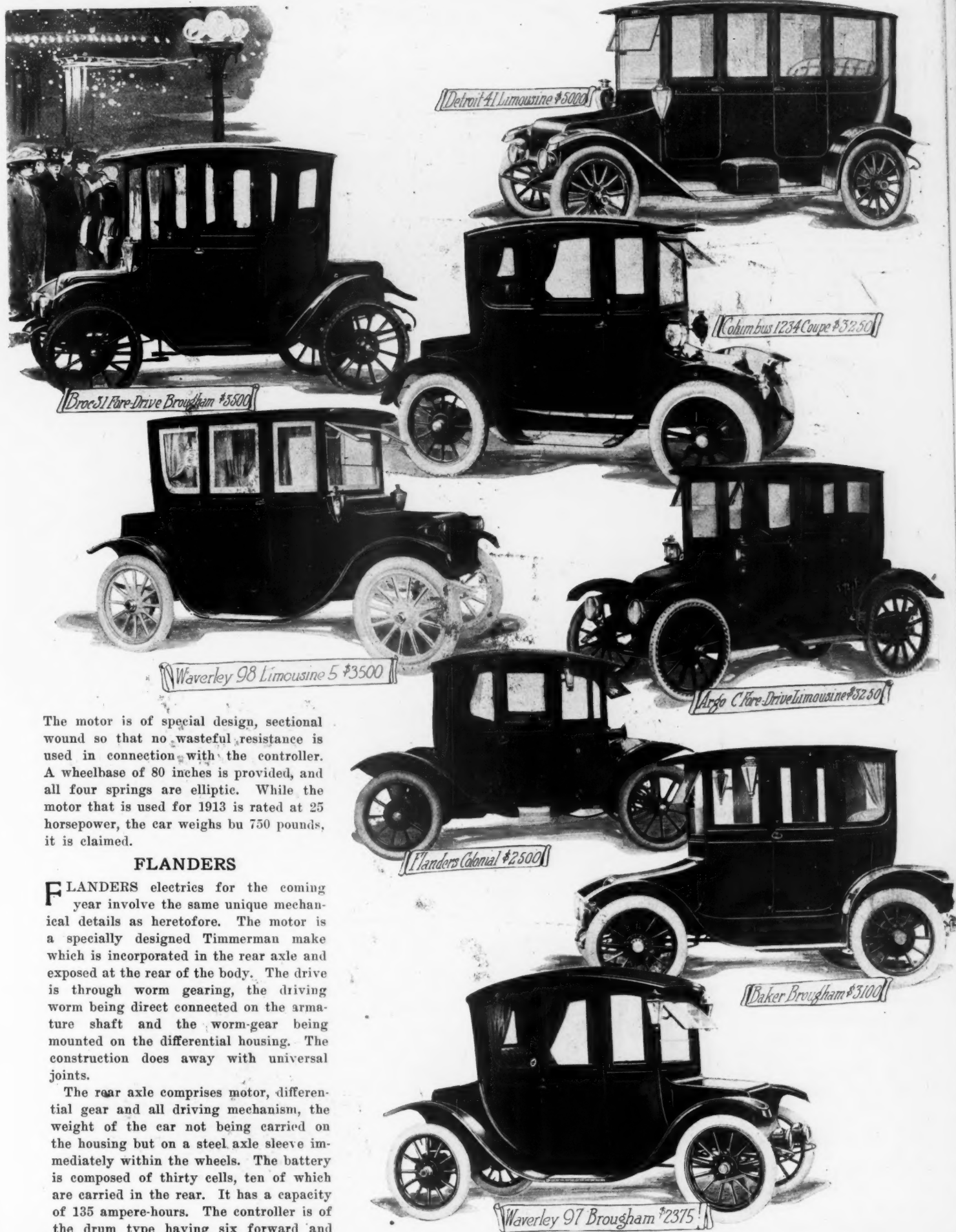
Other types include a women's victoria and a men's roadster in open bodies. These will be styled models 40 and 39, respectively. Model 37 is a larger edition of model 42, having seats for five passengers, and a wheel-base of 104 inches, instead of 96 inches as on model 42. Model 35 is of the standard extension brougham type with seats opposite, but having the clear-vision feature embodied in its construction.

There are three models which do not embody this feature of construction.

Model 36 is a slightly smaller model of the same type, while model 38 is a coupe built on the same chassis as the open roadster. Model 41 is a seven-passenger berline limousine, the body of which follows the lines of gasoline closed cars very closely. Option of lead or Edison batteries is offered at a difference in cost on all models except the limousine, which is supplied with the Edison battery only.

ELECTRA

LISTED as the lowest-priced electric on the American market the Electra is the product of the Storage Battery Power Co. It appears as a two-passenger roadster, the battery of sixteen cells being carried under the front hood. This hood is modeled after those found on gasoline cars, and the motor is carried under the seat, driving direct through spur gears.

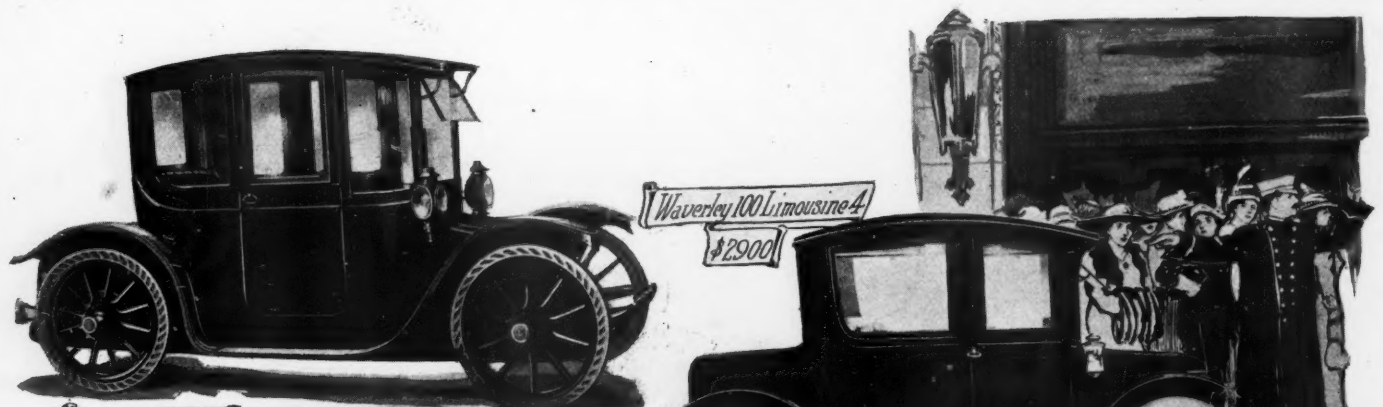


The motor is of special design, sectional wound so that no wasteful resistance is used in connection with the controller. A wheelbase of 80 inches is provided, and all four springs are elliptic. While the motor that is used for 1913 is rated at 25 horsepower, the car weighs but 750 pounds, it is claimed.

FLANDERS

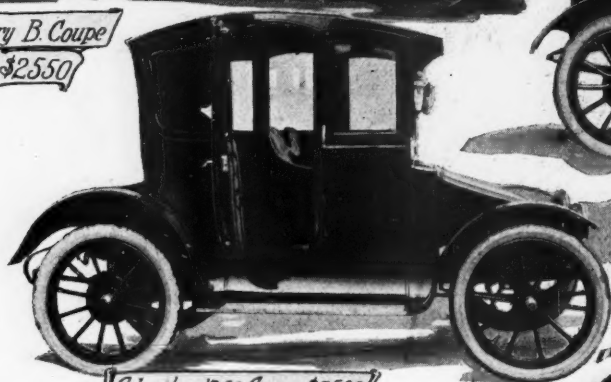
FLANDERS electrics for the coming year involve the same unique mechanical details as heretofore. The motor is a specially designed Timmerman make which is incorporated in the rear axle and exposed at the rear of the body. The drive is through worm gearing, the driving worm being direct connected on the armature shaft and the worm-gear being mounted on the differential housing. The construction does away with universal joints.

The rear axle comprises motor, differential gear and all driving mechanism, the weight of the car not being carried on the housing but on a steel axle sleeve immediately within the wheels. The battery is composed of thirty cells, ten of which are carried in the rear. It has a capacity of 135 ampere-hours. The controller is of the drum type having six forward and



Waverley 100 Limousine 4
\$2900

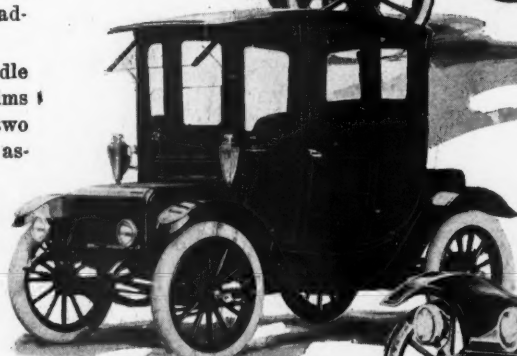
Century B Coupe
\$2550



Columbus 1250 Coupe \$3500



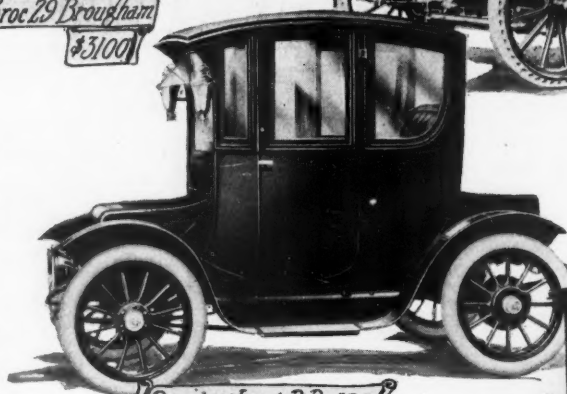
Chicago 132 Limousine \$3100



Broc 29 Brougham
\$3100



Argo A Brougham \$2800



Rauch & Lang D.B. 525
Demi-Brougham \$2800



Woods 1321 Brougham \$2700

reverse speeds and is operated by a lever. Steering is through a lever which has adjustable ball joints throughout.

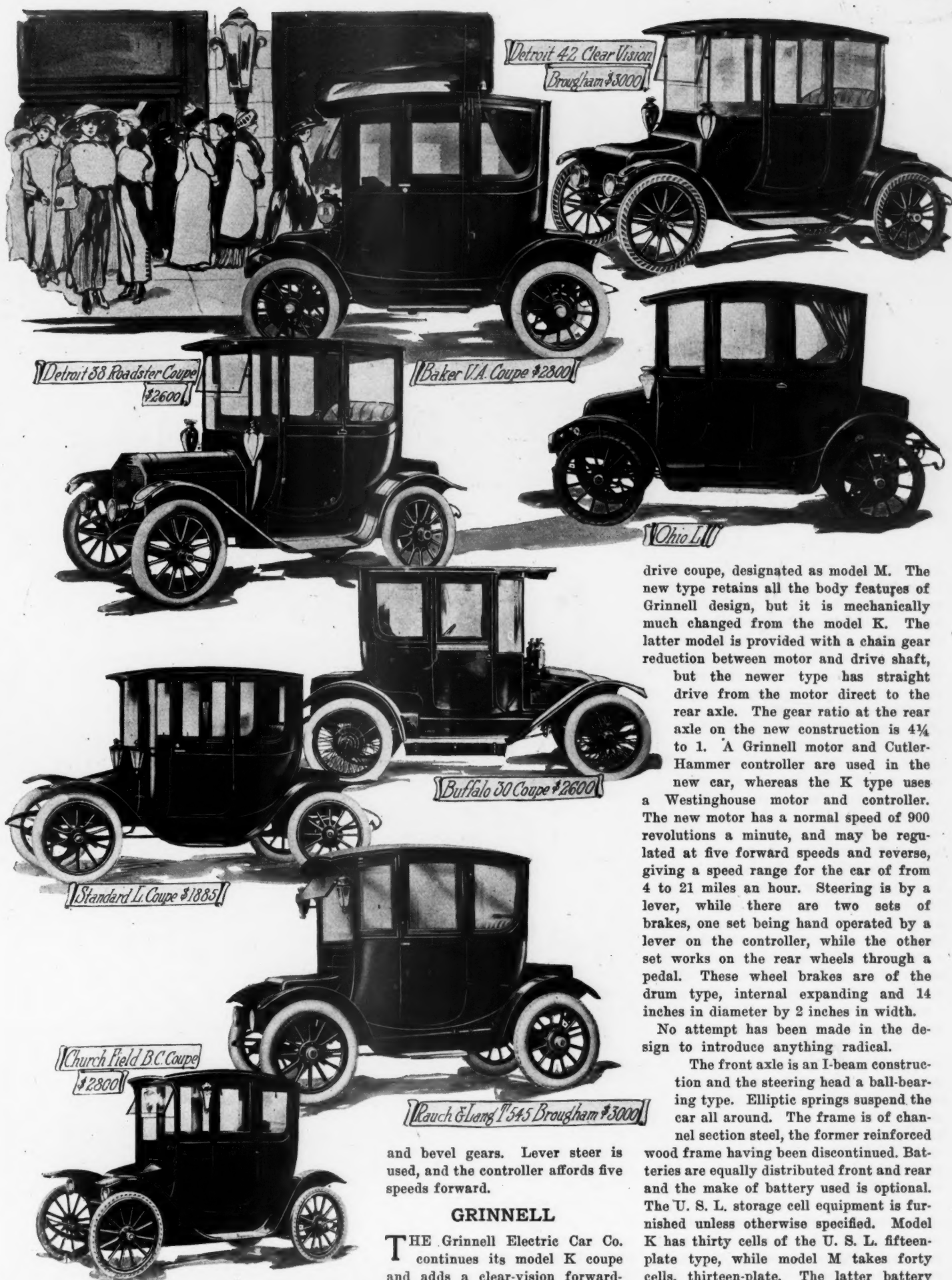
The Flanders car makes use of a cradle spring suspension, for which many claims for easy riding are made. There are two internal expanding brakes lined with asbestos which operate by foot pedals. The emergency brake is equipped with a locking device and is interconnected with the control so that when it is applied the current is automatically cut off. Bodies are of two types—a victoria and a colonial coupe. The equipment of the two is identical, the victoria being fitted with fore-doors. Both bodies are made of wood. The coupe seats five or six.

FRITCHLE

FOUR models of the Fritchle are made, three of which are built on the same chassis. The brougham, a new model seating five passengers, all facing forward, is built upon an 86-inch wheelbase, which otherwise is identical with the 88-inch wheelbase chassis used on the coupe, runabout and roadster. The coupe seats four, the runabout seats two, and the roadster seats four. The roadster is in reality a pheasant, having two seats with fore-doors.

The coupe is what is more commonly called a brougham, having two seats facing, while the brougham is in the usual parlance an electric sedan. Either cushion or pneumatic tires, 34 by 3½, will be fitted to Fritchle cars. The battery used is made by the makers of the cars, and is claimed to give a touring radius of 100 miles, the Denver concern being one of the pioneers in the production of an elec-

tric of such capacity. The battery consist of but thirty-two cells, which give 140 ampere-hours. The motor, too, is a home product and drives through a shaft



drive coupe, designated as model M. The new type retains all the body features of Grinnell design, but it is mechanically much changed from the model K. The latter model is provided with a chain gear reduction between motor and drive shaft, but the newer type has straight drive from the motor direct to the rear axle. The gear ratio at the rear axle on the new construction is $4\frac{1}{4}$ to 1. A Grinnell motor and Cutler-Hammer controller are used in the new car, whereas the K type uses a Westinghouse motor and controller. The new motor has a normal speed of 900 revolutions a minute, and may be regulated at five forward speeds and reverse, giving a speed range for the car of from 4 to 21 miles an hour. Steering is by a lever, while there are two sets of brakes, one set being hand operated by a lever on the controller, while the other set works on the rear wheels through a pedal. These wheel brakes are of the drum type, internal expanding and 14 inches in diameter by 2 inches in width.

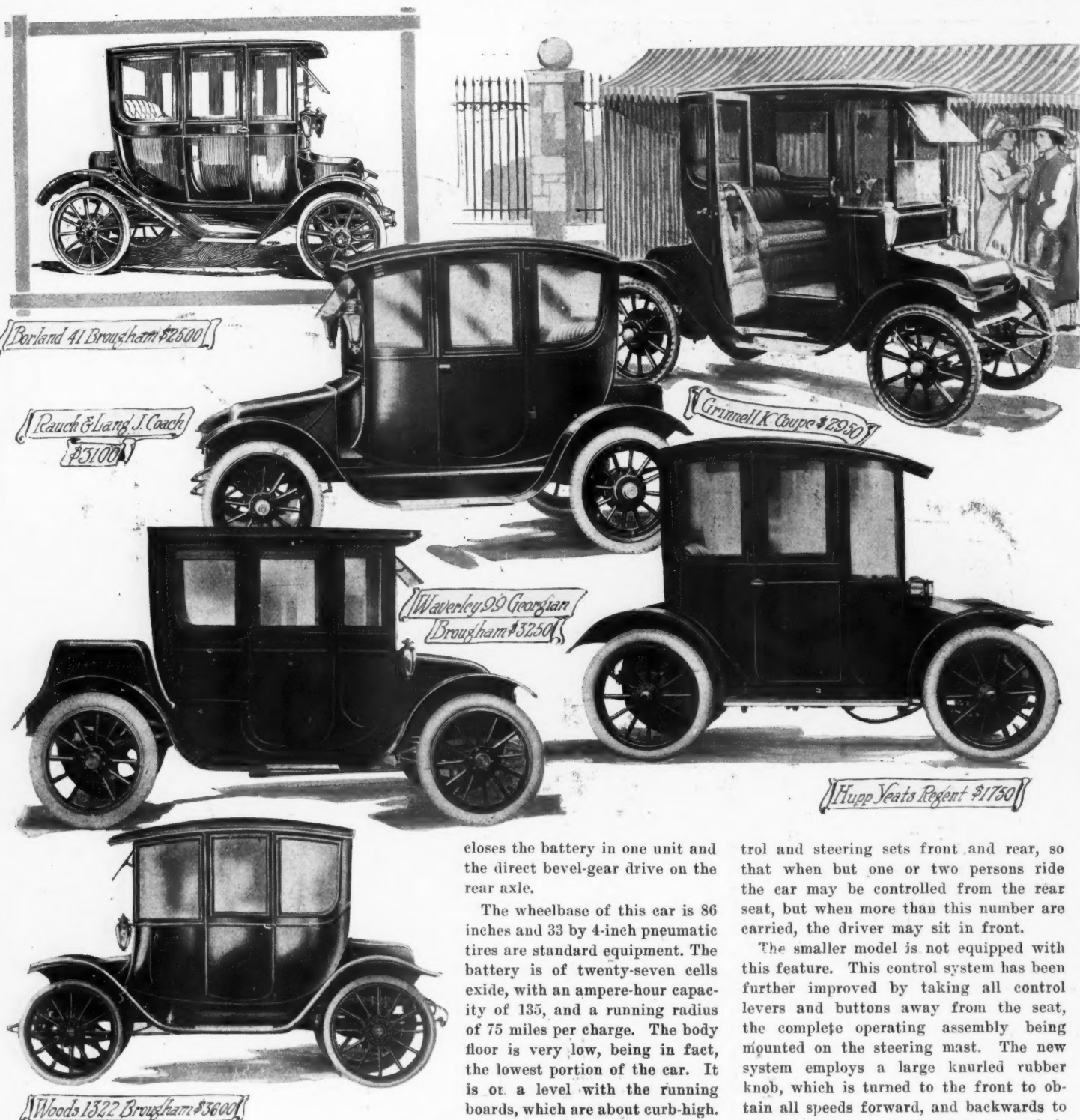
No attempt has been made in the design to introduce anything radical.

The front axle is an I-beam construction and the steering head a ball-bearing type. Elliptic springs suspend the car all around. The frame is of channel section steel, the former reinforced wood frame having been discontinued. Batteries are equally distributed front and rear and the make of battery used is optional. The U. S. L. storage cell equipment is furnished unless otherwise specified. Model K has thirty cells of the U. S. L. fifteen-plate type, while model M takes forty cells, thirteen-plate. The latter battery

and bevel gears. Lever steer is used, and the controller affords five speeds forward.

GRINNELL

THE Grinnell Electric Car Co. continues its model K coupe and adds a clear-vision forward-



has a capacity of 180 ampere-hours, making model M capable of doing from 90 to 100 miles on a charge. Tires are 34 by 4 inches all around. The wheelbase of model K is 94 inches and that of model M is 100 inches in length.

HUPP-YEATS

ONE model of the Hupp-Yeats line, the Patrician, has been dropped. This model was larger than the original Regent which still survives. The Regent shows only minor detail modifications. The low-swung coupe body, with its curved sides and low, sloping roof are retained, as is the French-type hood forward, which in-

closes the battery in one unit and the direct bevel-gear drive on the rear axle.

The wheelbase of this car is 86 inches and 33 by 4-inch pneumatic tires are standard equipment. The battery is of twenty-seven cells exide, with an ampere-hour capacity of 135, and a running radius of 75 miles per charge. The body floor is very low, being in fact, the lowest portion of the car. It is on a level with the running boards, which are about curb-high.

The roof is sufficiently high to make entry and exit easy, while the sides and roof slope towards a front pane of comparatively small surface. This in combination with the sloping hood decrease the wind-resistance. Five speeds are afforded by the controller, which is of the continuous-torque, drum type, operated by a side-lever and located beneath the seat.

OHIO

OHIO electrics have several new and patented features on the 1913 models, the large cars being equipped with the double-drive device which was introduced last year. This consists of duplicate con-

trol and steering sets front and rear, so that when but one or two persons ride the car may be controlled from the rear seat, but when more than this number are carried, the driver may sit in front.

The smaller model is not equipped with this feature. This control system has been further improved by taking all control levers and buttons away from the seat, the complete operating assembly being mounted on the steering mast. The new system employs a large knurled rubber knob, which is turned to the front to obtain all speeds forward, and backwards to reverse the car. Accidental reversal is prevented by a small latch which must be released by pressing a button to bring the reverse switch into play. The connection between this and the controller is electric, so that the knob turns quite easily. A Yale lock on this control assembly may be brought into play to secure the car against theft, when in neutral position.

A small button on its case operates the magnetic brake on the motor. Two sets of friction brakes are operated by foot pedals on the floor. Two sets of resistance are used, one of which is situated in the dash of the body, and may be cut into the circuit to heat the car in cold weather. The motor on the new models

drives direct, instead of through a secondary chain reduction, the same globe mounting on the drive shaft being used.

There are no universals in the shaft, but the globe support is placed between the axle and the motor, so the weights of the motor and the driveshaft and differential about balance, taking much unsprung weight from the axle. The motor is larger than last year, of the slow-speed type, although it produces no more power. The extra weight is compensated for by the elimination of the secondary transmission.

The battery is of forty thirteen-plate high-rib cells, which require no washout, instead of the high-cap low-rib batteries used last year. The tires are 4½ inches in tread this year instead of 4 inches as formerly. The wheelbase is 100 inches on both models, instead of 90 inches on one and 102 on the other. The bodies have been slightly enlarged and the general features refined.

RAUCH & LANG

NEW models brought out by the Rauch & Lang company are the town car, model TC; the two broughams, models T and C, and the revised model of the demi-brougham of last year, which will be known as model DB in 1913. Model J coach, with all seats facing forward is

continued from last season, with several improvements, one of which is the option of wheel or lever steer. Model B, the standard brougham, is practically identical with former productions, except as to a slight change in body lines. Other types are model CR, a two-passenger coupe, and model R, a two-passenger roadster. All models have been made slightly longer, and increased inside room provided.

STANDARD ELECTRIQUE

AS its name implies, the Standard electric is built up of standard features in the main, but several special features nevertheless are to be noticed. One of these in the rear system, which is a solid unit including the motor, axle, shaft and torsion tube, without universal joints. The shaft drives a bevel gear, on the hub of which is a spur pinion, in mesh with the large gear ring of the differential. The motor is supported on a gimble ring, similar to the suspension of a compass binnacle. None of the battery is carried under the seats, but is carried in two sets, in front and behind. No noticeable changes have been made over last year's production.

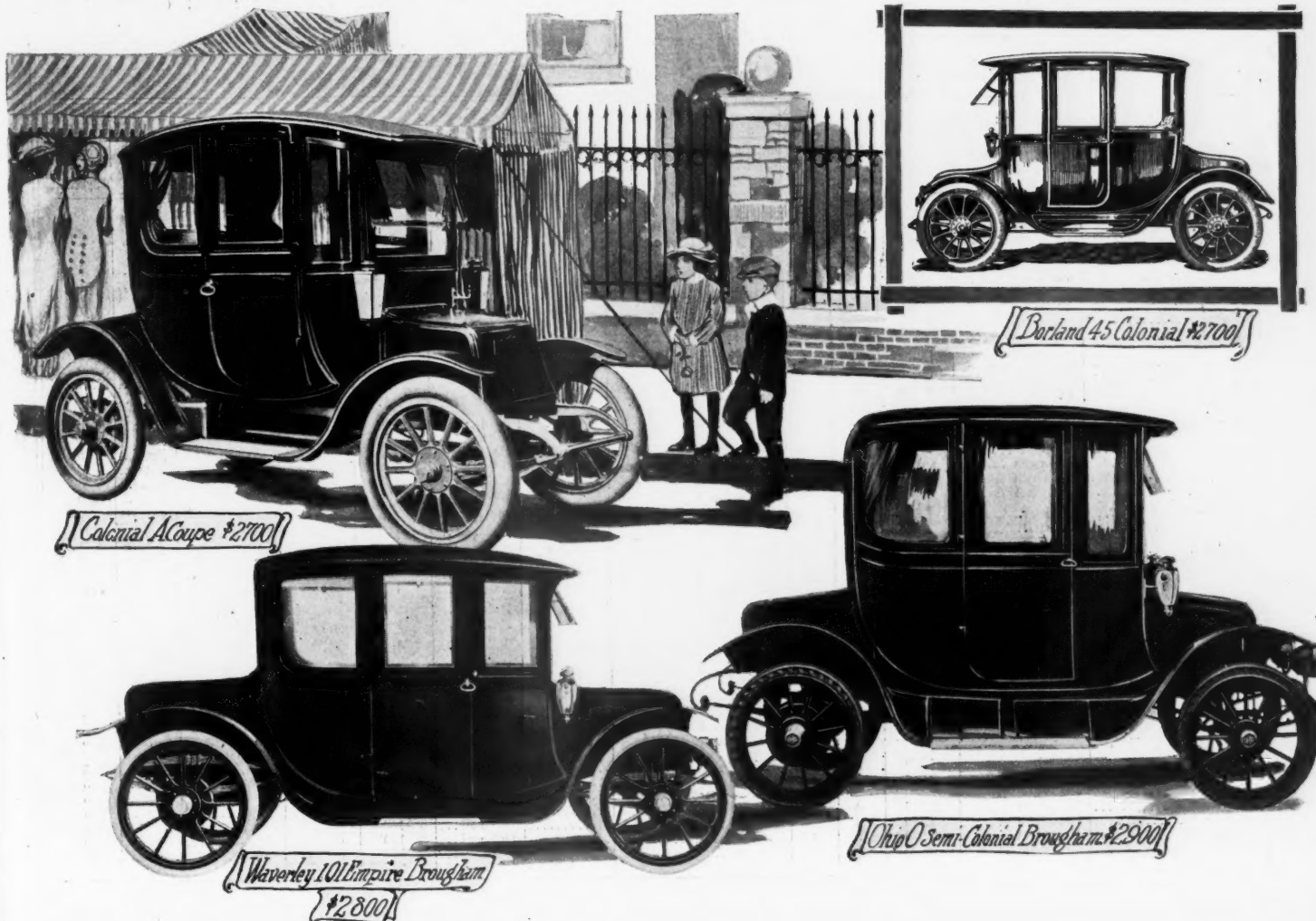
WAVERLEY

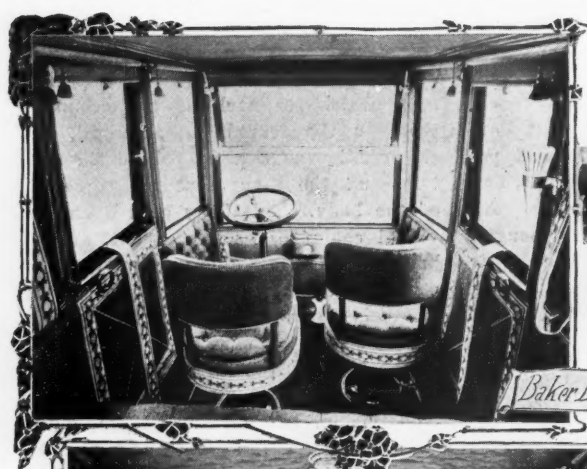
THREE models of Waverley electrics are continued from 1912, five are added, and two have been dropped. The latter two are models 88 and 91, four-pas-

senger brougham, of the standard type. One of the new models is the limousine four, model 100, which uses separate Pullman chairs for each of the occupants, three in the rear being arranged, with the middle one slightly behind the other two, and the front seat set cornerwise of the body. This body affords an individual chair for each occupant, and yet brings them in sociable proximity to each other. Commodious package-carrying space is provided behind the two side seats.

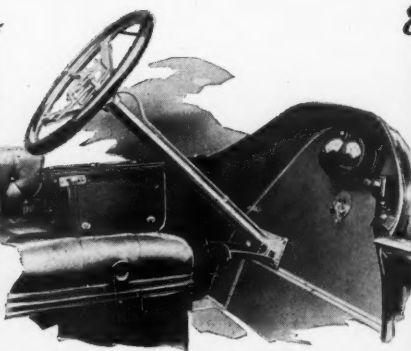
Another is the Georgian brougham, which is distinctly novel in design. This model is an extension brougham, with a French-type hood in front and a high battery box in the rear, which slopes out at the base on all sides, independent of the body. The Empire brougham is of the ordinary extension brougham seating arrangement, but owing to its low suspension, and simple continuous lines, it presents a solid and substantial feeling appearance that marks an advance over former productions of this type.

The Colonial brougham is similar to this model, except that the colonial spirit has been carried out in a compound curve at the rear, and an arched roof. Of the continued models, model 98, the limousine five is the leader, while model 90, the sheltered, gasoline-type roadster and model

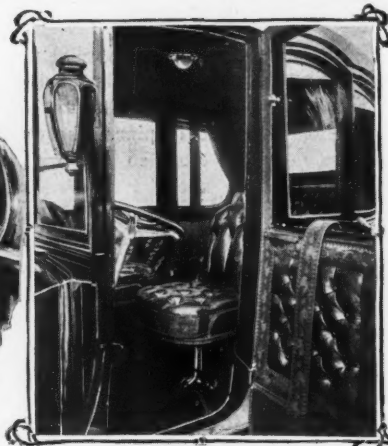




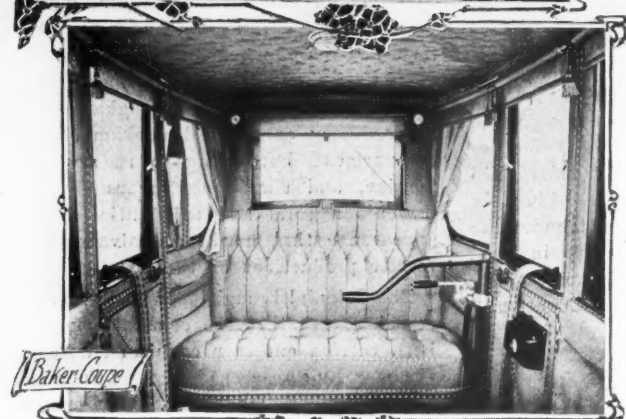
Baker Brougham



Church-Field B.R. Torpedo



Columbus 1250 Coupe



Baker Coupe

96 victoria are little different from the corresponding models of the year past. To

supply the demand for a light two-passenger coupe, model 93 has been added to the Waverley line.

WOODS

WOODS electrics are made in six models for the new season. Models 1317, 1320, 1321, and 1323 are all constructed on the same

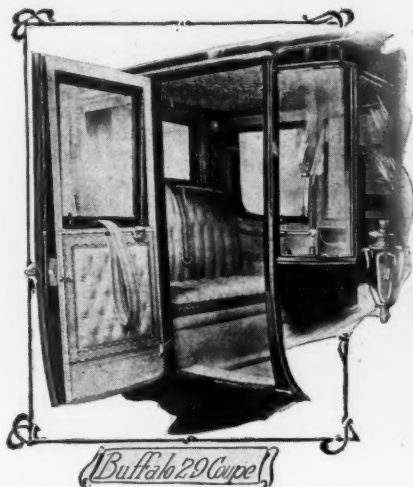
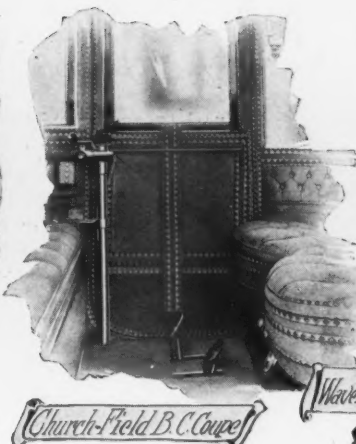
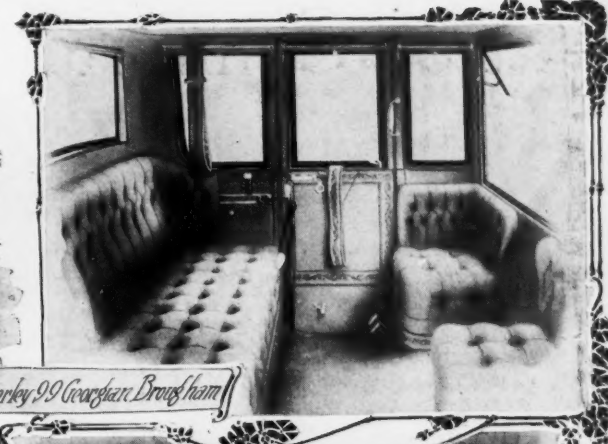
chassis, while 1322 has a wheelbase of 102 inches as against the 92-inch wheelbase on the other models. Characteristic Woods features are still in evidence, very little change having been made in the 1913 cars to distinguish them from those of 1912, except in the body lines, which have been greatly refined. Model 1319 is an open roadster seating five passengers. Model 1320 is a two-passenger roadster, which follows somewhat the lines of gasoline cars.

The forward hood has been constructed to imitate the bonnet of a gasoline car. Models 1317 and 1321 are of the conventional brougham type, the latter model being driven from the front seat. Model 1316 is the only model continued from

SPECIFICATIONS OF AMERICAN ELECTRIC PLEASURE CARS FOR 1913

Name and Model	Body Style	Price	Seats	Wheel-base	TIRES			BATTERY			Make of Motor	Final Drive	No. Forw'd Speeds
					Kind	Front	Rear	Make and Number of Cells	Amp.-Hr. Capacity	Mileage per Charge			
Argo, B.....	Roadster.....	2,500	4	108	Optional ...	Optional ...	Optional ...	Exide 40 ...	135	75-100	Westinghouse.	Bevel...	5
Argo, A.....	Brougham.....	2,800	4	108	Optional ...	Optional ...	Optional ...	Exide 40 ...	135	75-100	Westinghouse.	Bevel...	5
Argo, Fore Drive.....	Limousine.....	3,250	5	110	Optional ...	Optional ...	Optional ...	Exide 40 ...	135	75	Westinghouse.	Bevel...	5
Bailey, Roadster.....	Roadster.....	2,500	2	106	Pneumatic ..	32x3 1/2	33x4	Edison 52 ..	225	90-100	Gen. Electric..	Chain..	6
Bailey, Victoria Phaeton	Queen Victoria ..	2,600	3	82	Pneumatic ..	34x3 1/2	34x3 1/2	Edison 54 ..	150	75-90	Gen. Electric..	Chain..	4
Baker, V-A.....	Coupe.....	2,800	4	88	Pneumatic ..	32x4	32x4	Exide 32 ...	130	65-100	Gen. Electric..	Chain..	6
Baker.....	Brougham.....	3,100	5	92	Pneumatic ..	34x4	34x4 1/2	Exide 42 ...	140	65-100	Gen. Electric..	Chain..	6
Baker.....	Victoria.....	2,000	2	80	Pneumatic ..	32x3 1/2	32x3 1/2	Exide 28 ...	128	65-100	Gen. Electric..	Chain..	6
Borland, L.....	Colonial.....	2,500	5	96	Optional ...	34x4	34x4	Exide 40 ...	112	75	Gen. Electric..	Bevel...	.....
Borland, LI.....	Colonial.....	2,500	3	96	Optional ...	34x4	34x4	Exide 40 ...	112	75	Gen. Electric..	Bevel...	.....
Borland, 41.....	Brougham.....	2,500	5	93	Solid.....	32x4	32x4	Exide 40 ...	116	60	Gen. Electric..	Chain..	6
Borland, 45.....	Colonial.....	2,700	5	93	Optional ...	32x4	34x4	Exide, 40 ...	116	60	Gen. Electric..	Chain..	6
Borland, 60.....	Limousine.....	5,500	7	123	Pneumatic..	36x5	36x5	Exide, 44 ...	240	100	Gen. Electric..	Chain..	6
Broc, 20.....	Stanhope.....	2,100	2	84	Optional ...	Optional ...	Optional ...	Exide 28 ...	135	75	Westinghouse.	Bevel...	5
Broc, 28.....	Brougham.....	3,000	5	96	Optional ...	Optional ...	Optional ...	Exide 40 ...	135	90	Westinghouse.	Bevel...	5
Broc, 29.....	Brougham.....	3,100	5	96	Optional ...	Optional ...	Optional ...	Exide 40 ...	135	90	Westinghouse.	Bevel...	5
Broc, 31, Fore Drive.....	Brougham.....	3,500	5	96	Optional ...	Optional ...	Optional ...	Exide 40 ...	135	90	Westinghouse.	Bevel...	5
Buffalo, 29.....	Roadster.....	2,600	2	100	Pneumatic ..	34x4 1/2	34x4 1/2	Phila, 42 ...	140	50	Diehl	Bevel...	4
Buffalo, 30.....	Coupe.....	2,600	4	100	Pneumatic ..	34x4 1/2	34x4 1/2	Phila, 42 ...	140	50	Diehl	Bevel...	4
Century, B.....	Brougham.....	2,550	5	98	Optional ...	Optional ...	Optional ...	Exide, 36 ...	150	65-100	Westinghouse.	Bevel...	6
Chicago, 131.....	Coupe.....	2,800	5	96	Cushion.....	36x4 1/2	36x4 1/2	Exide 40 ...	140	100	Westinghouse.	Bevel...	5
Chicago, 132.....	Limousine.....	3,100	5	104	Cushion.....	36x4 1/2	36x4 1/2	Exide 40 ...	140	95	Westinghouse.	Bevel...	5
Church-Field, B-R.....	Torpedo.....	2,300	2	100	Optional ...	36x4	36x4	Phila. 26 ...	216	75	Wagner	Bevel...	10
Church-Field, B-C.....	Coupe.....	2,800	5	100	Optional ...	36x4	36x4	Phila. 24 ...	230	75	Wagner	Bevel...	10
Colonial, A.....	Coupe.....	2,700	4	96	Optional ...	Optional ...	Optional ...	Willard 40..	160	70	Westinghouse.	Bevel...	6
Columbus, 1250.....	Coupe.....	.....	4	100	Optional ...	36x4	36x4	Exide 40 ...	135	60-80	Gen. Electric..	Bevel...	6
Columbus, 1230.....	Coupe.....	.....	4	86	Optional ...	34x4	34x4	Exide 35 ...	135	60-80	Gen. Electric..	Bevel...	6
Columbus, 1218.....	Roadster.....	.....	2	92	Optional ...	34x4	34x4	Exide 36 ...	135	60-80	Gen. Electric..	Bevel...	6
Columbus, 1220.....	Coupe.....	.....	4	92	Optional ...	34x4	34x4	Exide 36 ...	135	60-80	Gen. Electric..	Bevel...	6
Columbus, 1204.....	Coupe.....	.....	4	86	Optional ...	34x4	34x4	Exide 35 ...	135	60-80	Gen. Electric..	Bevel...	6
Columbus, 1234.....	Coupe.....	.....	4	92	Optional ...	34x4	34x4 1/2	Exide 42 ...	135	60-80	Gen. Electric..	Bevel...	6
Detroit, 40.....	Victoria.....	2,300	3	85	Optional ...	.....	.....	Optional ...	140	65-100	Own.....	Bevel...	5
Detroit, 39.....	Roadster.....	2,350	2	96	Optional ...	.....	.....	Optional ...	140	65-100	Own.....	Bevel...	5
Detroit, 38.....	Coupe.....	2,600	3	96	Optional ...	.....	.....	Optional ...	140	65-100	Own.....	Bevel...	5
Detroit, 36.....	Brougham.....	2,700	4	85	Optional ...	.....	.....	Optional ...	140	65-100	Own.....	Bevel...	5
Detroit, 35.....	Brougham.....	2,850	4	90	Optional ...	.....	.....	Optional ...	140	65-100	Own.....	Bevel...	5
Detroit, 42.....	Brougham.....	3,000	5	96	Optional ...	.....	.....	Optional ...	140	65-100	Own.....	Bevel...	5
Detroit, 37.....	Brougham.....	3,600	5	104	Optional ...	.....	.....	Optional ...	140	50-85	Own.....	Bevel...	5
Detroit, 41.....	Limousine.....	5,000	7	112	Pneumatic ..	34x5	34x5	Edison 60 ..	225	50-75	Own.....	Bevel...	5

Note—Bevel, shaft drive with bevel gear reduction in rear axle; worm, shaft drive with worm gear reduction.

*Buffalo 29 Coupe**Church-Field B.C. Coupe**Waverley 99 Georgian Brougham**Waverley 100 Limousine 4*

1912 without a noticeable change in body design, retaining the 90-inch wheelbase formerly used. Notable among the changes for 1913 are the use of shaft drive without universal joints, the motor being mounted on flexible trunnions, which allow for springing.

Drive from the motor to the shaft is by herringbone gears, and from the shaft to the differential by the usual bevel gear and pinion. By means of improved design and lighter materials the weight of all chassis has been pared down to a considerable extent. Suspension on all models except model 1316 is considerably lower,

making the cars safer, and improving the appearance.

The rear axle housing on the new models has been reinforced and provided with radius rods extending to the forward end of the torsion tube in the form of a V. New batteries are used, which do not require washing. These batteries are of forty cells and eleven plates, placed in jars $1\frac{1}{4}$ inches higher than formerly, to

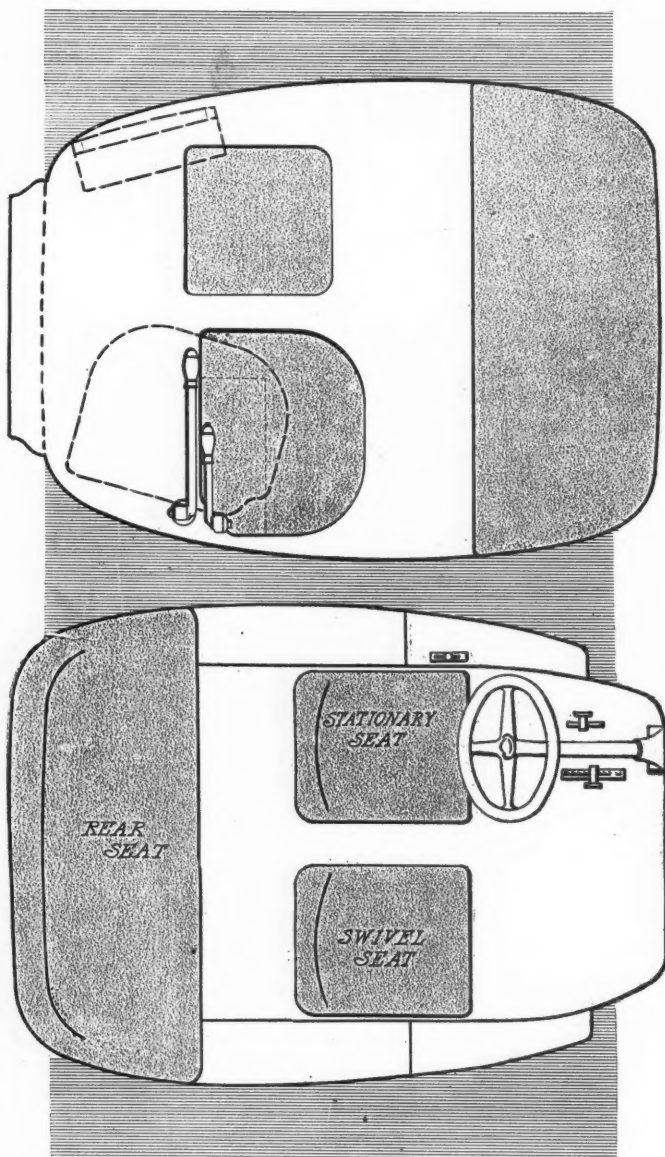
provide a 3-inch sediment space in the bottom of the jar.

SPECIFICATIONS OF AMERICAN ELECTRIC PLEASURE CARS FOR 1913

Name and Model	Body Style	Price	Seats	Wheel-base	TIRES			BATTERY			Make of Motor	Final Drive	No. Forward Speeds
					Kind	Front	Rear	Make and Number of Cells	Ampere-Hr. Capacity	Mileage per Charge			
Electra, C	Roadster	750	2	90	Optional	30x3	30x3	Haschke 20	150-175	75-100	Own	Bevel	4
Dayton, 112	Coupe	2,600	4	86	Pneumatic	33x4	33x4	Exide 30	147	75-100	Westinghouse	Bevel	5
Flanders	Victoria	2,200	4	100	Pneumatic	33x4	33x4	Own 30	135	75-100	Timmerman	Worm	6
Flanders	Colonial	2,500	5	100	Pneumatic	33x4	33x4	Own 30	135	75-100	Timmerman	Worm	6
Fritchle	Brougham	3,600	5	86	Optional	34x3	34x3	Own 32	140	100	Own	Bevel	5
Fritchle	Coupe	3,000	4	88	Optional	34x3	34x3	Own 32	140	100	Own	Bevel	5
Fritchle	Runabout	2,400	2	88	Optional	34x3	34x3	Own 32	140	100	Own	Bevel	5
Fritchle	Roadster	2,500	4	88	Optional	34x3	34x3	Own 32	140	100	Own	Bevel	5
Grinnell, M.	Coupe	2,800	5	94	Cushion	34x4	34x4	Optional	180	100	Westinghouse	Bevel	5
Grinnell, K.	Coupe	2,950	5	96	Cushion	34x4	34x4	Optional	185	85	Westinghouse	Bevel	5
Hupp-Yeates, Regent	Coupe	1,750	4	86	Pneumatic	33x4	33x4	Exide 27	135	75	Westinghouse	Bevel	5
Ohio, O	Semi-Col., Brough	2,900	5	96	Optional	33x4	33x4	Exide 40	160	100	Crock-Wheel	Bevel	5
Ohio, L	Colonial Brougham	3,200	5	96	Optional	33x4	33x4	Exide 40	160	100	Crock-Wheel	Bevel	5
Ohio, M.	Brougham	3,200	5	96	Optional	33x4	33x4	Exide 40	160	100	Crock-Wheel	Bevel	5
Ohio, Y.	Semi-Col., Brough	3,500	5	96	Optional	33x4	33x4	Exide 40	160	100	Crock-Wheel	Bevel	5
Phipps	Coupe	2,500	5	107	Optional	36x4	36x4	Exide 40	165	75-100	Westinghouse	Bevel	5
Rauch & Lang, R-545	Roadster	2,600	2	92	Optional	Optional	Optional	Exide 40	138	50	Hertner	Bevel	6
Rauch & Lang, CR-545	Enclosed Roadster	2,800	2	92	Optional	Optional	Optional	Exide 40	138	50	Hertner	Bevel	6
Rauch & Lang, DB-525	Demi-Brougham	2,800	4	92	Optional	Optional	Optional	Exide 40	138	50	Hertner	Bevel	6
Rauch & Lang, BB-545	Standard Brougham	2,900	4	92	Optional	Optional	Optional	Exide 40	138	50	Hertner	Bevel	6
Rauch & Lang, CC-545	Colonial Brougham	2,900	4	92	Optional	Optional	Optional	Exide 40	138	50	Hertner	Bevel	6
Rauch & Lang, T-545	Brougham	3,000	5	92	Optional	Optional	Optional	Exide 40	138	50	Hertner	Bevel	6
Rauch & Lang, J-545	Brougham	3,100	5	103	Optional	Optional	Optional	Exide 40	138	50	Hertner	Bevel	6
Standard, M.	Coupe	1,885	4	96	Pneumatic	32x3	33x4	Exide 30	138	75-100	Westinghouse	Bevel	6
Waverley, 90	Roadster	2,250	3	104	Cushion	Optional	Optional	Optional 34	138	75	Own	Bevel	5
Waverley, 97	Brougham	2,375	4	104	Pneumatic	33x4	33x4	Optional 40	138	75	Own	Bevel	4
Waverley, 101	Brougham	2,800	4	106	Cushion	Optional	Optional	Optional 40	138	75	Own	Bevel	4
Waverley, 100	Limousine	2,900	4	106	Cushion	Optional	Optional	Optional 40	138	75	Own	Bevel	4
Waverley, 99	Brougham	3,250	4	109	Optional	Optional	Optional	Optional 40	138	75	Own	Bevel	4
Waverley, 98	Limousine	3,500	5	109	Optional	Optional	Optional	Optional 40	138	75	Own	Bevel	4
Woods, 1320	Roadster	2,400	2	92	Solid	32x2	34x2	Exide 40	140	80	Own	Bevel	5
Woods, 1319	Victoria	2,500	4	92	Solid	32x2	34x2	Exide 40	140	80	Own	Bevel	5
Woods, 1321	Brougham	2,700	5	92	Solid	32x2	34x2	Exide 40	140	80	Own	Bevel	5
Woods, 1317	Brougham	2,700	4	92	Cushion	32x2	34x2	Exide 40	140	80	Own	Bevel	5
Woods, 1323	Brougham	3,100	5	92	Cushion	34x3	38x4	Exide 40	140	80	Own	Bevel	5
Woods, 1322	Brougham	3,600	5	102	Solid	36x4	40x4	Own 42	140	80	Own	Bevel	5

Note—Bevel, shaft drive with bevel gear reduction in rear axle; worm, shaft drive with worm gear reduction.

Art of Comfortably Seating Passengers



CHICAGO FRONT-DRIVE BROUGHAM
ARGO FRONT-DRIVE BROUGHAM

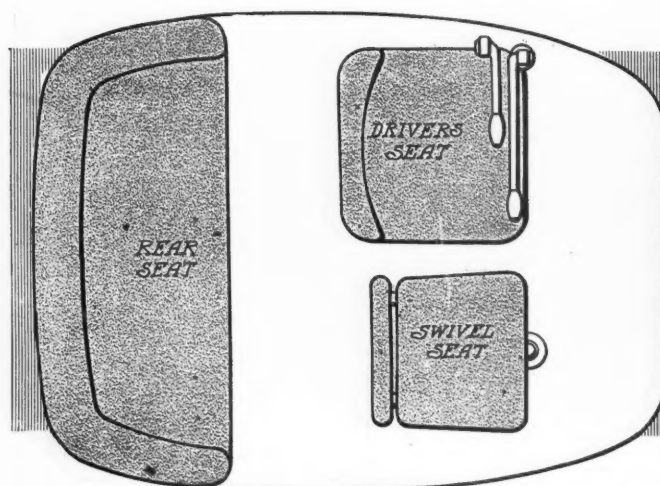
IN variety and completeness of equipment, motor vehicle coach-builders have fairly outdone themselves in the design of 1913 electric bodies. There is a well defined cause for the unparalleled acceleration of development in this line which we now are witnessing, as there is for every improvement. In this case this highly commendable result is due to the mechanical evolution of the electric vehicle, which has enabled it to widen its sphere of application, and to appeal to a larger class of buyers.

Improved batteries, improved motors, and improved transmission arrangements, have so enhanced the efficiency and ability of the electric pleasure car that a class of buyers, hitherto unknown to the trade, has been attracted. This class comprises those users of motor cars who do not care to employ a chauffeur, and desire a motor car as a means of transportation and social convenience—a buying public that wishes to enjoy the maximum of comfort in rapid and convenient transit, with the least attention to the mechanical aspects of the car. Finally, this class of buyers demands more than the simple victoria or coupe, with which former buyers were content. The car that caters to this class must have the capacity of a touring car, with the simplicity of the electric.

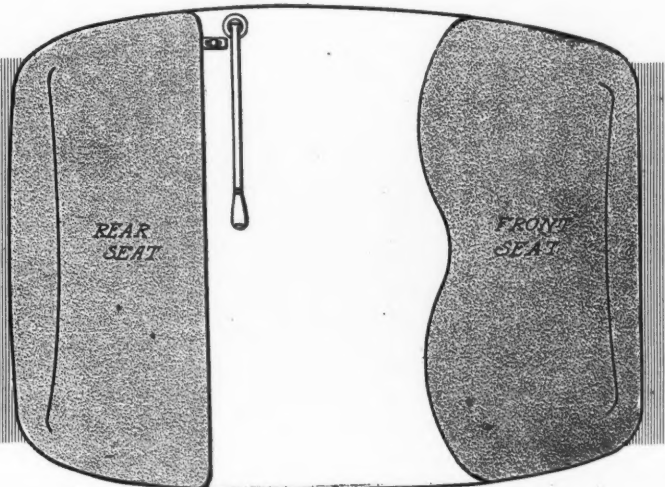
Last year saw several examples of front-facing four and five-passenger broughams, most of which are to be seen again on the 1913 market. New styles have been evolved, however, that surpass in convenience and economy of room all previous productions. There are two general types of clear-view bodies, namely, bodies that enable the driver to obtain a clear and unobstructed view of the road ahead, as distinguished from the conventional two-seated brougham in which the front seats face the rear. The first of these is the front-drive brougham, sometimes called the limousine, but which is not, properly speaking, to be classed in that category. In this the driver occupies an individual seat at the front of the body, while at his side is an auxiliary chair, and behind him the main seat. The second type is the rear-drive type, in which the driver sits on the main seat, and the occasional seats in front are so arranged that their occupants do not obstruct the vision of the driver. This type has the advantage of a neater appearance when the driver rides alone.

In the front-drive type, one is apt to feel awkward sitting alone in the forward part of the car, while if seated in the rear, the absence of other occupants is not apparent, nor are the empty seats so noticeable to the operator. This may seem a trifle finely drawn, but it suffices to induce some manufacturers to produce separate models of each type to satisfy the preferences of those favoring either type.

One manufacturer has succeeded in embodying the good features of both types in one body by facing all passengers for-



DETROIT CLEAR-VISION BROUGHAM



STANDARD BROUGHAM

As Developed for Electric Car Users

ward, and fitting two control pillars, one for the left front seat, and one for the rear seat behind it. Another maker has designed a four-passenger body in which each passenger has a separate chair. Two of these are on the side, close to the middle of the car, one is between these but slightly behind them, and the fourth is in front, facing the left, so the passenger's body is out of the range of vision of the driver who is seated at the left.

In the first class is the Chicago electric. In this body the driver occupies a seat on the left side, forward of the main seat. This seat is on a pivot, and may be swung to the position shown by the broken lines, to permit the use of the left-hand door. The auxiliary chair on the right folds flat against the right wall.

Another of this type is the Argo, in which the driver sits to the left in a stationary seat, while the auxiliary chair is swung on a swivel, and in use is close to the driver. The seats in this car are quite well forward, foot-room being obtained by an extension cowl beyond the windshield. This affords access to the left door, and leaves an abundance of knee room for the occupants of the rear seat.

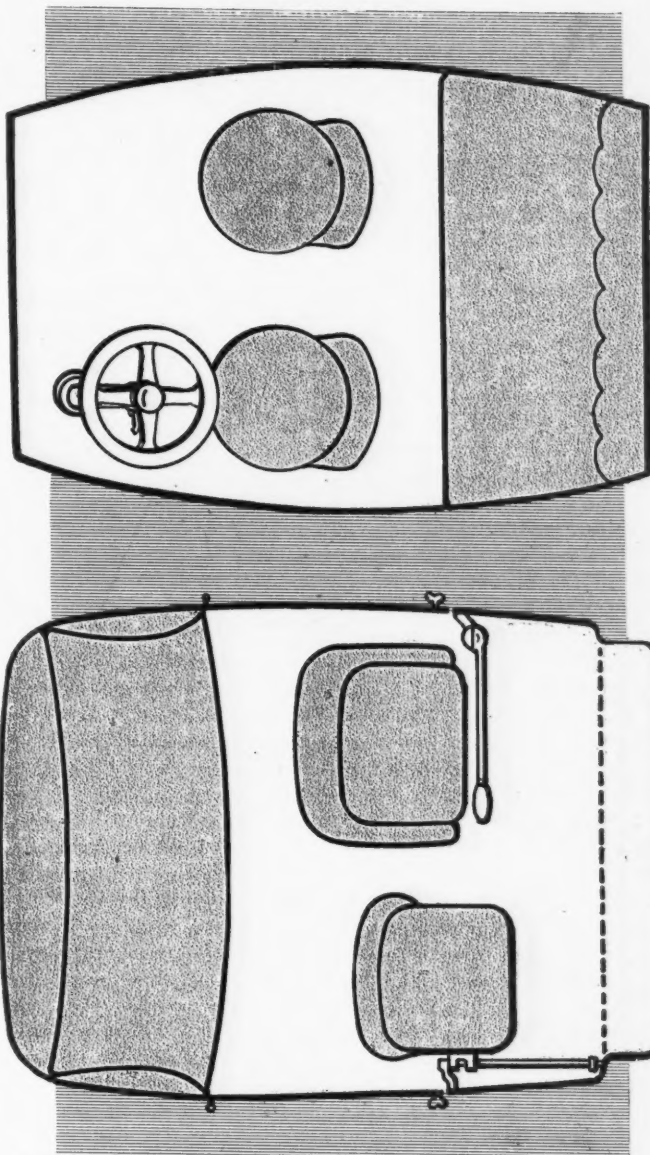
The Detroit is similar to these, except that the auxiliary chair is mounted on a pivot, and may be reversed, so that the occupant may face the rear. The Rauch & Lang that is shown has round, revolving chairs for both the driver and his companion, which may easily be turned out of the way to allow of entry and exit.

The Waverley brougham has the driver situated in a seat sufficiently in the rear to make the appearance graceful, still affording a passage to the rear for access to the left door. The auxiliary chair in this model is on a sliding rack, so that it may be pushed forward to permit entry and exit from the right, or to be reversed and slid forward, allowing the occupant to face the rear.

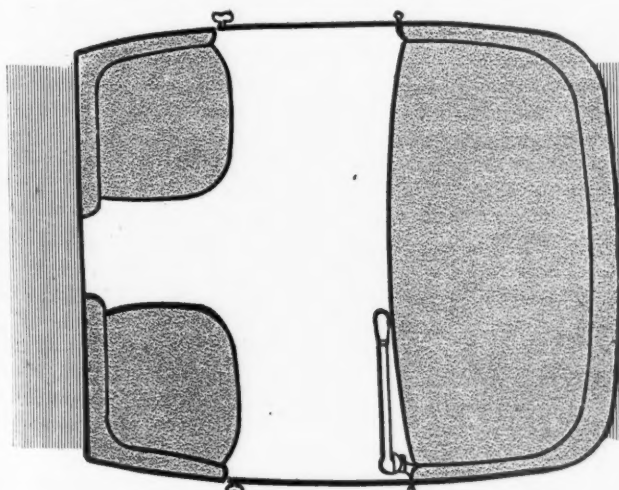
The Standard electric is a good example of the conventional brougham, while the Waverley Georgian brougham is a representative of the clear-view, rear-drive brougham. The front seats in this car are set cornerwise, so the bodies of the passengers are placed against the sides of the glass front, affording the driver a wide range of vision between them.

The Waverley limousine-four is one of the compromise types, the extra passenger sitting cornerwise, or sidewise, being so far to the right that he constitutes no impediment to the view of the operator.

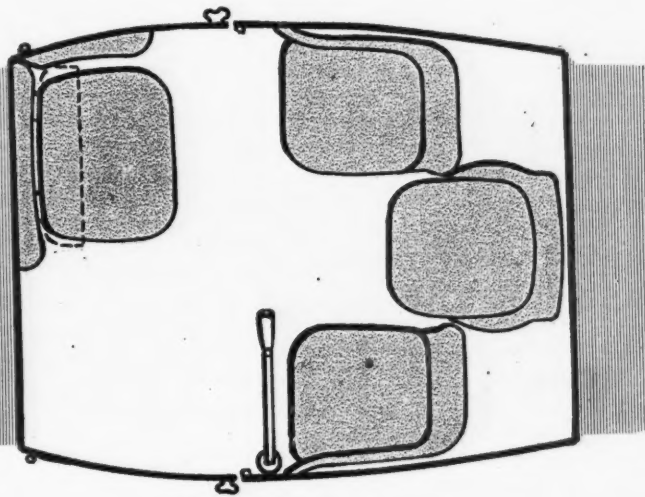
A notable feature of the Detroit electric is the elimination of much of the solid paneling, especially on the corners. These have been replaced with curved glass panes, which in conjunction with greatly narrowed door frames and window frames, afford practically as clear a view as an open car.



RAUCH & LANG FRONT-DRIVE BROUGHAM AND WAVERLEY LIMOUSINE FIVE



WAVERLEY GEORGIAN BROUGHAM



WAVERLEY LIMOUSINE-FOUR

Electric as the Gas Car's Side Partner

About 75 per cent of Chicago Electrics Complement to Gasoline Cars

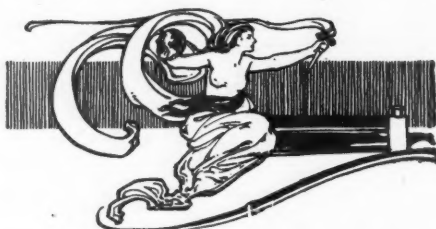
CHICAGO, Dec. 30—A conservative estimate of the increase in the number of owners of gasoline cars who have purchased electric pleasure vehicles as a complement to the larger machines shows that whereas from 55 to 60 per cent of Chicago owners had electrics a year ago in connection with their gasoline cars, that at the present time this has been increased to from 70 to 75 per cent, with the prospect of an even greater increase during the next 12 months.

Chicago is conceded to be the electric stronghold of the country and of the 25,000 cars owned in this city, probably from 5,000 to 6,000 are electrics, of which some 200 are commercial machines. No other city in the United States can make this showing, although Chicago cannot boast of holding the per capita record. This, it is said, belongs to Cleveland, with Detroit a good second, and Rochester, Syracuse and Kansas City well to the front.

The reason for the supremacy of Chicago can be traced back to the early days of the industry. The Electric Vehicle Co., of Hartford, Conn., brought out the Columbia electric in 1893-94 and this was followed closely by the Waverley. In 1897 the Fischer Equipment Co., of Chicago, making electrics became the Woods company and at once there started a fight for Chicago trade. Outside makers, it is said, fought for a footing in Chicago and the Woods company made just as hard a fight in its own territory. The result was that Chicago at once became most prominent in the electric field, which position it has since maintained.

Outside of this, however, Chicago can thank its fine system of boulevards for the popularity of the electric. One can travel 45 miles around the boulevard system here, while the business district is so peculiarly situated that it lends itself to improving the electric situation in that it is an easy matter for the women folk to drive to the loop without having to fight their way through congested traffic. The roads, too, are level and in winter time the park commissioners see to it that the boulevards are kept free from snow.

As elsewhere, Chicagoans appreciate the economy of the electric when it is run in conjunction with a gasoline car. It is possible to dispense with the service of a chauffeur, the big gasoline car is saved useless running over short distances, while still another argument is that an electric keeps peace in the family in permitting the woman of the house to have a vehicle for her own use while friend husband is using the gasoline car.



St. Louis Promising Field Electric Coupe and Small Gas Car Is the Favorite Combination

ST. LOUIS, Mo., Dec. 30—That the purchasers of pleasure vehicles in this territory are looking to the car for the woman as well as for the man is proven by the number of combination sales that have been made in the last year by the dealers who are handling both gasoline and electric pleasure cars.

It is safe to say that at least five out of every ten prospects consider the electric coupe and the small open gasoline car in preference to the high-priced gasoline car with two bodies—touring and limousine.

H. G. Brouster, manager of the electric car department of the Park Automobile Co. of this city, is enthusiastic about the prospects for the coming year in electrics being sold in connection with small gasoline cars. This company is one of the largest dealers in gasoline and electric cars in St. Louis, handling the Chalmers and Baker electric.

According to Mr. Brouster, 40 per cent of the customers of his firm are users of the small gasoline car and electric coupe; and the idea is growing in favor with them all the time. He spoke of four customers of his firm who had been using a high-priced gasoline car with limousine and touring bodies and these when shown the saving and advantages of the combination, immediately did away with their chauffeurs and high-priced cars and purchased the combination.

This firm has about eighty coupes in this city and practically all of them are used in connection with a small gasoline car, and what, Mr. Brouster states, is proving the success of the combination idea is the fact that it is almost impossible to purchase a second-hand electric.

Service departments maintained by many of the dealers are doing much for the sale of electric cars in this territory.



New York Has Few Electrics Which Mostly Supplement Horse Service

NEW YORK, Dec. 30—According to careful canvasses of the situation, there are about 500 electric pleasure cars owned and operated in the metropolitan section. Compared with the distribution in Philadelphia, Chicago and St. Louis, the New York patronage of the electric pleasure vehicle is small. However, the recently formed local association has prepared plans to stimulate trade and the results of the campaign already are apparent. As to the ownership of the cars already distributed, the figures are as follows:

Cars owned without supplementary gasoline equipment	386
Cars owned in connection with gasoline cars	93
Undetermined	19
Total	498

Sixty-two of the reported sales this year were to customers already owning gasoline cars, indicating a greater tendency toward that class of business.

The selling of electrics in New York is kept distinct from the gasoline motor car business. Only three concerns handle gasoline and electric cars together. These are the Hupp-Yeats, Flanders and Rauch & Lang. The two former companies handle cars made by the same manufacturing companies that make gasoline cars and the latter company is housed in the same store with a gasoline car agency. The Baker, Rauch & Lang and Detroit all report a shortage of cars and delivery is deferred on current orders for from 6 to 10 weeks.

The customers who buy electrics range all the way from the man who has a family of daughters and who purchased five electric cars in one order and who has no gasoline car at all, to the customer who owns a costly gasoline car, with or without an inclosed body, and who wishes an electric for supplementary service. The large showing of cars owned without supplementary gasoline equipment is accounted for by the fact that wives of gasoline car owners frequently own electrics in their own names.

The electric supplements horse service to quite an extent. Several of the old conservative families of New York have purchased electrics within the past year for use in connection with the horse conveyances.

Estimates of business for 1913 average about 60 per cent larger than the sales of 1912. For the first 11 months of 1912 the sales have been around 200.

The type of car most in demand in New York is the brougham. Despite the mixed road and traffic conditions in New York, the cushion tire retains its popularity with the electric clientele.

Valuable Adjunct to City Man's Garage

Pittsburgh Reports Increasing Interest Despite Many Steep Hills

PITTSBURGH, Pa., Dec. 28—Pittsburgh's interest in electric cars is increasing at a geometrical rate. Five years ago an electric was a curiosity in the Steel city. It created even more comment than the first gasoline motor car. The old school class of grunTERS and knockers who had predicted for years that the motor car never could succeed in Pittsburgh on account of steep grades and poor streets had evidently forgotten how futile their efforts had been, for they renewed their howl and prophesied nothing but failure for the electric.

Notwithstanding these direful predictions the number of handsome, clean, noiseless, comfortable cars, especially for winter use, which are scouting around Pittsburgh streets at present is increasing so and taking notice with a sharp eye to the profit side of their ledgers.

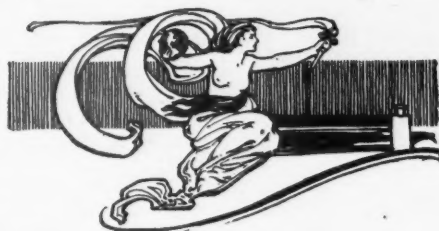
The electric is here to stay. Whether it will eventually take the place of the limousine as an every-day car is the question. No doubt it has certain big obstacles here to overcome that it does not have in other cities. Cleveland, Buffalo, Detroit and other cities with broad, level streets offer an immensely greater opening for sales of electric vehicles than Pittsburgh.

On the other hand, Pittsburgh has probably a much larger proportion of very wealthy families which can afford touring cars, limousines and also electrics. This class in itself is large enough in the Pittsburgh district to make a big field for electric cars during the next few years and it is this field which the electric car agencies here are working hardest at present. How well they are succeeding is shown by the fact that there are now from 175 to 200 electric cars in use in this city. It is predicted that by 1914 at least 500 electrics will be seen on Pittsburgh streets.

The inquiry for electric cars never was so good as now. Nine-tenths of those who have bought electrics in the last 2 years are recommending them heartily. As a result there has been a big campaign of education put on in this city by the makers and dealers.

The experience of manufacturers with hills and other fixed difficulties has been a mighty valuable one and local agencies report an immense improvement in those features of electric car construction which were hardest to overcome in Pittsburgh.

These two facts—the education of the electric buyer and the success of the manufacturer in overcoming difficulties—have contributed wonderfully to the sale of and inquiry for electric vehicles.



Milwaukee a Stronghold Two-thirds of Electric Owners Have Both Types of Machines

MILWAUKEE, Wis., Dec. 29—Milwaukee lays claim to being one of the best electric towns in the country, despite the fact that topographical conditions are none too favorable toward the use of vehicles propelled by electric motors. A small coterie of dealers have become actually wealthy by grasping the opportunity offered several years ago to take on lines of electric cars and pushing the battery vehicle for all it is worth to the present day.

At the end of the year 1912 it is found that in the city of Milwaukee there are owned and being operated about 300 electric pleasure cars, and, it is interesting to note, approximately forty-five electric commercial cars. Of all cars owned in Milwaukee, the electric pleasure car holds something more than 6 per cent, and the percentage is steadily being increased, for the gain during the entire year of 1912 is nearly 35 per cent over the number owned at the end of 1911.

Of all owners of electric vehicles in Milwaukee, only about 33½ per cent are the property of persons who own no other motor cars, giving 66½ per cent of owners who own both gasoline and electric cars for pleasure purposes. This indicates that the electric car is an active complement of the gas car, and as such is a trade factor in a field that offers almost unlimited opportunities in Milwaukee. Motoring has taken so deep a hold on the gasoline motorist that he no longer stops running when cold weather sets in, but is buying an electric rather than pay an almost equal amount for a good, stylish limousine body for his gas car—particularly when the change from summer touring body to winter inclosed body entails a large additional expense such as refinishing the chassis, fenders, hood, radiator, wheels, etc., to make the chassis look something near like and as tasty as the limousine.



Minneapolis Finds Many Reasons Why Electrics Are Popular

MINNEAPOLIS, Minn., Dec. 28—Especially adaptable to Minnesota's climate, the electric pleasure car has an extensive sale in the large cities, particularly Minneapolis and St. Paul. It is found to supplement the use of the gasoline motor car and finds sale easily among the class that utilizes the gas car in warm weather. Dealers who carry both gas and electric lines in Minneapolis advance many reasons for the sale of the electric to supplement the gasoline machine as well as to sell on its own merits. Some of these reasons are as follows:

The electric car fills out a full line of motor cars. It may be driven by the entire family, whether accustomed to the gas car or not.

Expense is saved by substituting the electric car in winter in gas, oil and incidental purchases for the gas car and in the wages of a chauffeur.

The electric car is always ready when charged and emancipates the family from slavery to a chauffeur.

Essentially a cold weather car the electric is usable even when the gasoline car falls from chilling of the engine or freezing.

Possession of an electric car permits the gasoline car to be overhauled in the winter without discommoding the family.

Exceptional public service opportunities are offered for the electric car. It is called for and delivered, charged and groomed.

As a newcomer to the Minneapolis territory, C. R. Newby, district manager for the Flanders company, which is represented by the Twin City Motor Co., finds the electric car admirably fitted to fill out the gasoline line. The electric car propaganda as supplementing the gasoline Flanders line is to be pushed to the limit.

"Sale of electric cars comes partly from bad weather," said Mr. Newby. "The sale of electrics has been held up here to an extent because of the fine weather. The electric may be called a bad weather car. It is suitable for common use of the family, for women to shop and for men to get to and from the office. One feature here this year is that suburban people are taking up the electric car along with the gasoline car, because while a year ago they were afraid to go more than a block from the city they know now the electric gives capable service anywhere. Before, they were afraid to utilize an electric to their suburban homes in winter and therefore moved into the city for the cold months. Now it is possible for them to utilize the electric safely and the result is that many families are staying at their summer homes this fall and winter."

L. H. Fawkes, of the Fawkes Automobile Co., who is agent for five gasoline cars as well as the Ohio electric, said: "It is a good thing to have an electric car line on the floor so as to please everybody that wants a car. Some people, I find, are buying electrics instead of purchasing a limousine body to fit their tour-

ing car chassis. This enables them to put the gas car in the shop and to have it painted; while the family has free use of a car all the time in the electric, which is a good winter car."

F. B. Stone, manager of the Waverley branch, co-operating with the Jackson gasoline car branch as co-tenant of a new building, sees large possibilities in the electric car sale along with that of gasoline machines. He believes they are supplementary lines. In addition to the stock reasons that the electric car is easily handled by women and children, and therefore especially acceptable to the family accustomed to gasoline car travel, because it is semper paratus and without the aid of a paid driver, he has found a good argument in the tale of a customer. This man said to Mr. Stone: "I am thoroughly disgusted with the limousine for winter. I have to employ a chauffeur and when my wife wants to go to the theater in the afternoon, or to a cafe, she rings a bell for the chauffeur and he does not answer, and she doesn't know where he is. After she gets in communication with him and finally drives down town, she is not sure whether she will find the driver when the theater is over. Coming outside she is as likely as not to see him half a block away talking with other chauffeurs, or possibly he has been out riding with some friend, and has not returned. I shall do away with the limousine and have an electric."

"People naturally follow their own ideas about whether to buy an electric car," said Mr. Stone, "and decide as to whether they can afford one and a touring car for the summer season. There are lots of gas car owners who are buying electric cars for this season. There is an opening to sell the electric car to supplement the gas car. There is no question about that. It is a good thing to remind the people that the electric is the thing to use after laying up the touring car for the winter."

A. E. Archer, manager for the Columbus Buggy Co., is alive to the supplemental possibilities of the electric car. His company makes and sells both types of car. "A great many persons buy gas cars with touring body for summer use and the electric car for winter use, and so the whole family can get the use of both cars, especially in the summer season," said Mr. Archer. "Lots of times a man wants to use his touring car himself, then the electric car fits in nicely because his wife or daughters can use the electric at the same time. Then it is cheaper to maintain an electric car in winter than the gas car."

"It is not necessary to keep a chauffeur at an expense of \$65 to \$75 or \$100 a month in the winter. The electric car can be maintained for less than \$75 in winter, and it will cost at least \$125 to buy gas, oil and other incidentals for the gas car. We find the cars work together, although we handle them with separate sales departments, in separate repair shops and garages."

Gaining in New England

Boston's Narrow Streets Handicap Dealers Selling Electric Cars

BOSTON, Mass., Dec. 27—Electric vehicles are making greater progress in New England the past year than they have for half a dozen years put together. This is due to the fact that there was organized more than a year ago the Electric Vehicle Club, comprising the men who sell both the pleasure and commercial types, and then there followed a campaign of education along advertising lines that told the people here what to expect from these vehicles.

Yet better results could be achieved but for the fact that Boston handicaps the electrics more than any other big city because of its narrow streets necessitating traffic rules that are a hardship on motor owners. When cars are not allowed to stand unattended more than 5 minutes; when they may not stand at all on certain streets; when they can remain but 20 minutes with someone in them, it means that women to whom the electrics appeal for shopping or theaters must either go down town in the street cars or go in motor cars with a chauffeur.

Attempts have been made to get parking spaces down town for cars, but the nearest places designated are nearly ½ mile away from the big department stores and so they are of no use. With the narrow streets, too, making traffic congested, it means that it is a difficult task for women to pilot their cars down town anyway, especially if they are inclined to be at all nervous.

Therefore the dealers cannot talk electrics for shopping or theaters. So they must go on the other tack and suggest their use for afternoon calls, which being for the most part in the Back Bay district or suburbs make the vehicles ideal. Also the fact that there are splendid boulevards for motor trips gives a chance to talk along those lines. Even here there is also a handicap, for the finest boulevards are along the north shore, yet, strange to say, there is no decent connection with them from Boston; motorists being forced to travel through Cambridge and Somerville along congested streets with many turns that taxes the skill of an expert driver, let alone a woman.

Despite these handicaps, however, the dealers are making progress and one sees many more electrics now than formerly.

There are very few dealers in gasoline cars who also carry the electrics as an auxiliary line in Boston. J. W. Bowman, handling the Stevens-Duryea, also has the Waverley. He has had it now for nearly a year. In talking about the sales of electrics to people who had gasoline cars he said that the number of such sales made by him were very few. The greater number he sold were to people who had no

other vehicle, and for the most part they were women.

J. S. Harrington has the Flanders line of both gasoline and electrics. He stated that the business in electrics is beginning to pick up now. In his sales he has found several instances where owners of gasoline cars have taken on the electrics for use as town cars. He stated that the number of such sales were not so very numerous, but they showed a tendency that way, and his company is going to try to develop the business.

A. P. Underhill handles the Knox and the Grinnell electric. This latter is a recent acquisition. Mr. Underhill stated that there was a field for the electric as an adjunct to the gasoline car as well as for its own use alone, but it will have to be gradually developed in Boston.

Then there is the R. C. H. branch handling both lines. Manager Wheeler stated that for a new proposition the Hupp-Yeats has done very well as an adjunct to the gasoline car.

The Tyler Brothers Corporation handles the Columbus electrics and formerly had a gasoline line. This latter was dropped and another one is being signed up now. Lucius Tyler, manager of the concern, is very enthusiastic over the electric proposition in New England.

"We have found that it is possible to sell electrics to people who have gas cars, and a number of men who were on our books when we were selling the gasoline line alone have since bought electrics for their families. The tendency we have found is that with the improvements of late in the way of self-starters, demountable rims, excellent service stations near at hand it has made owners more independent of chauffeurs, and, in fact, many now do their own driving. So they can use their gasoline car themselves, and they get electrics for their families, more particularly now as many men use their gasoline cars for business a great deal."

"In Massachusetts alone there are more than 100 public stations along the main traveled roads, and the territory is honeycombed with electric railroad lines, so it is possible to get batteries charged almost everywhere in New England."

Baltimore Just Starting

Despite Hills and Bad Streets Interest in Electrics Is Increasing

BALTIMORE, Md., Dec. 28—The Monumental City at present is not an electric city from the standpoint of the motor car. This does not mean that the citizens of this city are opposed to the electric car, but that the physical conditions of the city and surrounding territory are not adapted to the successful use of the electric car.

High hills and bad streets have been the drawback in this section and have tended to make the electric car a thing

of the future. There has been, however, a wholesale improvement of streets and roads due to drastic legislation by the state legislature and large appropriations by the municipal government in consequence of the passage of loans for improved pavements. In every section of the city smooth streets are being laid and with these in place of the old cobblestones and the improved roadways by the state roads commission, Baltimore and the various sections of Maryland bid fair to become just as popular from an electric standpoint as the city of Washington, which is only 40 miles away, but where there are any number of the electric cars in use.

Just at present there are only two electric pleasure cars represented in this city and the agencies for these are held by dealers who do not handle gasoline cars, and consequently there are no car owners in Baltimore who have both electric and gasoline cars. There are about twenty to twenty-five electric pleasure cars owned in Baltimore and these owners have only the one car.

In other words, the conditions here are such that at this time it is impossible to give the electric cars a fair and equal chance to show their worth. In most cities, according to dealers who claim to know, the electric cars can go at least 50 miles without being recharged, while they have been known in Washington to make as high as 80 and 90 miles on one charge. The most that they have given in Baltimore under ordinary circumstances has been from 25 to 30 miles.

Dealers here who have been interested in the matter are frank to say that, judging by the attitude of many of their customers and among car owners who have conversed on the subject, there are any number of Baltimoreans who have a leaning toward the electric car, especially for such purposes as attending church on Sundays and special occasions, or the theaters or private dinners and social events, but they are at this time afraid to take the chances until the new street paving crusade has been fully completed and realized.

Then the dealers look for a rush of electrics and quite a few of them have intimated that they will get into this line of the business when the proper time comes for the venture. Many of the doctors around town have expressed the opinion that with the same conditions prevailing here as in many other cities the electrics would be just the thing for them, but that they must wait until Baltimore can offer better traffic facilities before buying this type of car.

Altogether the statements of dealers and others interested in the matter it is fair to say for the electrics that they have a bright future in this territory within the next few years and that the end of 1913 will see a material increase in the number in use in New England.

Denver Has Good Report Of 6,000 Cars Registered, 15 per cent Are of the Electric Type

DENVER, Colo., Dec. 30—The development of the electric vehicle field in Denver during the past 2½ years has been remarkable. In June, 1910, there were in operation on the streets of Denver 480 electric pleasure vehicles and three electric commercial machines. Today there are 852 of the pleasure vehicles and forty-five of the commercial trucks run by electric power. It is estimated that the city now has in the neighborhood of 6,000 cars of all kinds, 15 per cent of the total number being electric vehicles. While there are fifty gasoline commercial machines, or five more than the number of electrics of the same class, there are orders already placed for more than twenty of the electric machines for early delivery; and it is prophesied that the electric trucks will soon outnumber the gasoline type.

The several dealers that are handling both gasoline and electric cars are unanimous in declaring that the electric trade furnishes a highly profitable adjunct to their general business, especially because of the strong tendency among people of considerable wealth and wide business and social interests to own both classes of cars. It is estimated that fully one-fourth of the owners of electric pleasure vehicles in this city are also owners of gasoline or steam cars, the latter usually being purchased first and for more general purposes. The larger cars, as a rule, are maintained for general family or business use, and especially for long trips, while the electrics are used largely by the women and for different kinds of calls confined principally within the city. It is also noticeable, however, that many bankers, lawyers, physicians and other business and professional men are making extensive use of electric runabouts for their business calls.

One of the chief reasons why the electric is receiving such a hearty reception in Denver by both merchants and private individuals is said to be the comparatively low cost of both repairs and power. The rates charged by public garages for the care of electric vehicles are also exceedingly reasonable, considerably lower, it is claimed, than in other sections of the country. The usual rate for a 5-ton truck is \$45 per month, which includes current, charging and caring for batteries, oiling, washing, and everything.

Many owners of electrics are installing their own charging equipment, and it is said that those having their own charging plants find that an electric pleasure vehicle alone seldom requires more current than is furnished for the minimum rate of \$5 per month. The amount of current reported for this cost is 1,250 kilo-

watt hours. Instances are reported, furthermore, where the owner of both a gas car and an electric coupe, noting the small amount of current required for the electric, has sold his gas car and purchased an electric roadster or runabout in the place of it, and has found that he is frequently able to keep the batteries of both vehicles charged at the minimum cost of \$5 per month.

As for the pleasure vehicles, another important factor in their favor especially is the convenience of operating. There is also a very marked tendency among the business men of this city to make their calls in light convenient electrics rather than in the heavier and more cumbersome gasoline cars.

Weather Helps Atlanta Mild Climate in South Makes Gasoline Limousine Unnecessary

ATLANTA, Ga., Dec. 28—Five of the dealers in Atlanta handle electrics in conjunction with a line of gasoline cars. The composite opinion of the five is: "It pays. The electric line is as good or better a money-maker than the gasoline."

Anywhere south of the Mason and Dixon line the combination of gasoline touring car and electric coupe has a full 100 per cent advantage over a gasoline car with touring and limousine bodies. The reason is the weather.

Dixie is likely to have a little severe weather each winter. But except along the northern edge it is never long continued. This means that there is not over 1 month out of the 12 when an average southern owner wants to use a limousine body—unless he has in addition a touring car on another chassis. The combination of electric coupe and gasoline touring car therefore is the natural one. The electric coupe serves all purposes for bad weather as well as in good.

The other advantages of the combination of gasoline and electrics are too obvious to need mention, especially as they are shared alike by north and south. One fact, however, is especially worthy of attention, as follows: The southern field is the best, all things considered, in America.

Atlanta, where the electrics have been pushed, has from 300 to 500 cars, which is about a normal supply for a city of Atlanta's size and wealth. On the other hand, Chattanooga—this is on the solemn word of the southern representative of an electric vehicle company—has not a single electric, in a city of 44,604 population. Macon, with 40,665, has not over a half dozen. In Augusta, where the population is 41,040, there are not a dozen—and this is a particularly wealthy city. Nashville, with its 110,364 people, has only a small scattering of electrics and the same is true of hustling Birmingham, with 132,685 population. In a general way the same condition prevails throughout the entire south.

Commercial Electric Vehicles

IT is generally conceded that electric pleasure vehicles do not encroach or the preserves of those of the gasoline types, but occupy a territory entirely distinct. Gasoline commercial vehicles, however, seem to have in the electric truck a real competitor; not that there is danger of the electric truck driving the gasoline truck from the field, but in certain lines they give promise of equal or greater efficiency than the gasoline type of truck.

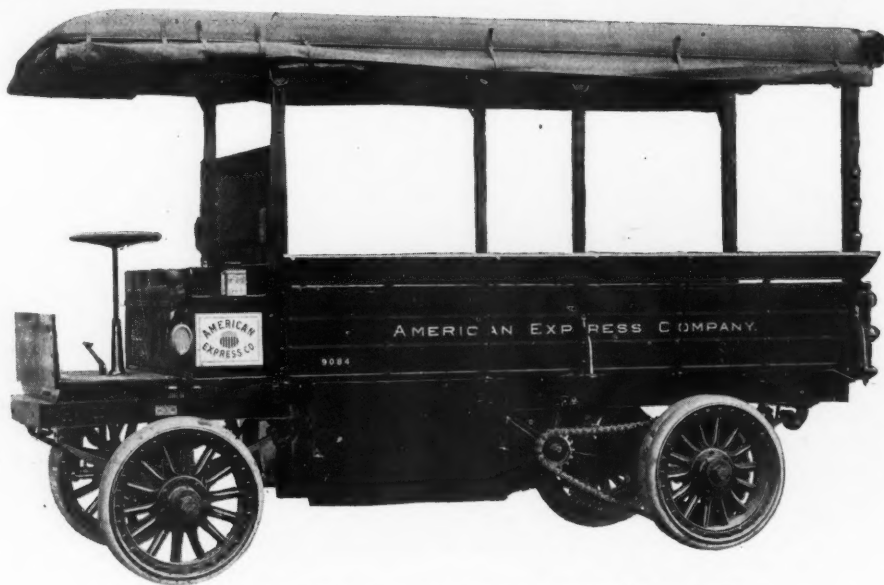
Notable in this connection is the satisfaction that electric trucks are known to give in short hauls, house-to-house work, and in route hauling. To these requirements the electric truck is admirably adapted because of its flexibility, its facility in starting and stopping and its ease of control. Teamsters, with practically no previous training, may be trusted with an electric truck, and in routed service a knowledge of the route and the details of the business involved is more important than mechanical ability.

Development of Electric Truck

Two-thirds of electric trucks now in service are said to be from 2 to 3 tons capacity. The catalogs for 1913 in many cases embrace more and larger models, and the supply of 3½ to 5-ton and even 6-ton electric trucks promises to be adequate for the present season. However, no radical departures from former practice have been extensively indulged in, the experience of service having pointed out numerous small improvements, but not having warranted the abandonment of standard practices.

Platform Type Body Popular

The platform type of truck is by far the most in favor, this type being characterized by the clearing of the upper portion of the chassis of practically all appliances, the battery, motor, counter-shaft, resistance boxes and controller being carried beneath the frame. This leaves the space above a clear platform upon which any style of body may be fitted, while the driver is seated at the extreme front. The low suspension of the component parts in this manner brings the center of gravity low, and makes the car much more stable. Double chain drive to the rear wheels seems to be nearly universal in heavy trucks, while various drives are adopted in light delivery wagons. Worm-drive, bevel-gear drive, spur-gear drive and direct internal gear



GENERAL VEHICLE CO.'S TRUCK FOR EXPRESS SERVICE

drive, with the motor mounted in or on the rear axle, and in one instance front axle, are offered.

Drive from the motor to the counter-shaft usually is by silent chain, with occasional variances, such as shaft and bevel gear, direct bevel gear and spur gears. Drive chains, both primary and secondary, are being inclosed to a greater extent than formerly, notably in the larger trucks. Left-hand steering is nearly universal, having been adopted some years ago, and since then tenaciously adhered to. Battery boxes are being made less of wood and more of metal, while many ingenious methods of removing the battery have been devised by the makers. Side removal seems to be in greatest favor, due to the fact that the batteries then need not be lifted, and that the load portion is thus made solid, without traps to leak dust and dirt into the battery compartments, and making the removal or washing of the battery possible without removing the load, which is decidedly convenient.

Moderate Speeds Favored

Moderate speeds seem to have the preference, the motors being so designed and geared as to make speed above a certain maximum impossible, except in descending from grades, where common caution serves to prevent overspeeding. The speeds allowed in good practice are inversely proportional to the load carried,

Electric Commercial Vehicles

Argo
Atlantic
Bailey
Baker
Borland
Champion
C. T.
Detroit
Fritchle
G. M. C.
General Vehicle
Jatco
Lansden
M. and P.
Toledo
Urban
Walker
Ward
Waverley

light 500-pound delivery cars being allowed from 12 to 18 miles per hour, while the heavy 5-tonners rarely are allowed to exceed 7 miles per hour. Average 2 and 3-ton trucks are allowed speeds from 10 to 11 miles per hour. A tendency for longer wheelbases has manifested itself.

ARGO

COMMERCIAL electric cars in two models are manufactured by the Argo Electric Vehicle Co., of 1000 and 2000 pounds capacity, respectively. These chassis are alike, except as to capacity, with the exception of their wheelbases, which are 86 and 96 inches respectively, their tires 34 by 3 and 35 by 3½, respectively, their battery capacities, and a few other lesser details.

Argo commercial cars are of the platform type, none of the essential parts projecting above the chassis frame. Their motors are secured as a unit with the rear axles, and drive through bevel gears, and the batteries are suspended below the middle of the cars. Wheel steer is used, and the controller handle is located under the wheel on the steering column. Body types other than an open express are made to the order of the purchaser at extra cost.

ATLANTIC

PRODUCED in four models, the Atlantic commercial electrics offer a range in carrying capacity from 1 to 5 tons. The first of these has a wheelbase of 102 inches, with 34 by 3½-inch front tires and 34 by 4-inch rear. The motor is suspended above the rear axle, and drives to a countershaft, and from thence to the rear wheels by double chains. The battery is optional. Control is by a side-lever, four forward speeds being afforded. The drive is from the left side, and suspension is by half-elliptic springs all around.

The next largest model is of 2 tons capacity, has a wheelbase of 114 inches and tires 34 by 4 and 36 by 4, respectively, front and rear. The next above this is of 3½ tons capacity, has a wheelbase of 135 inches, and tires 36 by 5 by 40 by 4, and the largest, the 5-ton model, has a 144-inch wheelbase, with 36 by 6 and 40 by 5-inch tires. The last three models are similar to

the smaller in all mechanical features, except as regards size and proportions, which are modified to suit the loads to be imposed upon them.

BAILEY

FOR light loads of not above 500 pounds, the Bailey service electric is offered as an auxiliary to the Bailey line of pleasure electrics. It consists of a light run-about with provision in the rear for the carrying of a small box, 32 by 24 inches. It has a wheelbase of 106 inches and tires 33 by 4. Edison batteries are regularly furnished with these cars. The control is by an inclined wheel, on the left side of the car, with the controller handle above it. The motor is located under the seat, and drives by double chains.

BAKER

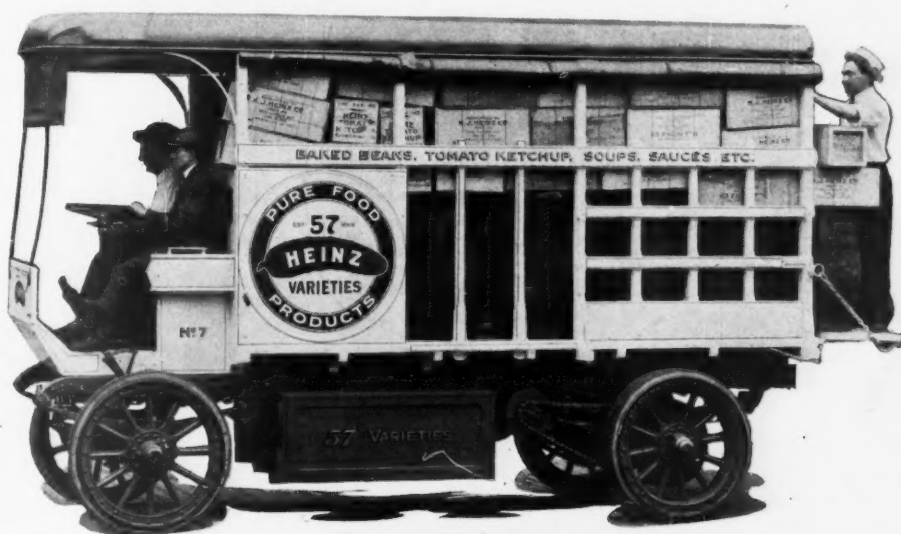
FIVE models of commercial electric trucks are offered by the Baker Motor Vehicle Co. These range in capacity from 500 pounds to 3½ tons in capacity. All models are alike in general plan, having a straight pressed steel frame supported by four half-elliptic springs. The battery on all models except the smallest is supported underneath the chassis frame, and the jackshaft on each is immediately be-

hind it. Drive to the jackshaft is from the motor, behind it, and between the drive-wheels, and by an incased silent chain. From the jackshaft to the wheels the drive is by roller chains. Drive is from the left side, at the extreme front of the chassis, control being by means of a lever under the wheel, a pedal, and a side-lever.

All models use I-beam front axles and square section rear, except the 500-pound delivery car, which has a tubular front axle. The heavier trucks have their drive-chains incased in pressed steel housings. Bodies are made to order on all models except the 500-pound delivery car, which is furnished in open and panel bodies. A special provision has been made whereby all principal parts of the chassis may be lubricated from the outside, without removing, or in any way disturbing the body.

BORLAND

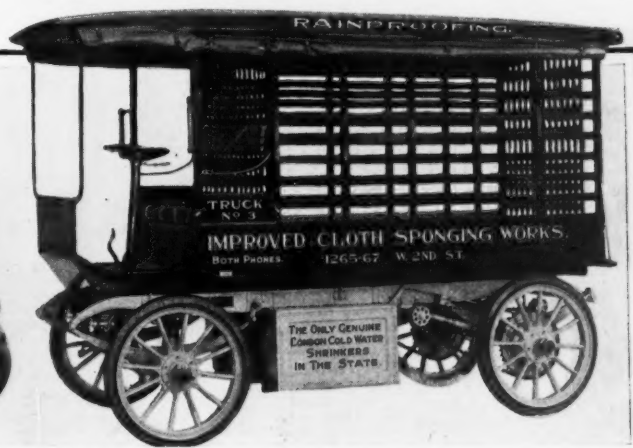
AS an accessory to a line of pleasure cars, the Borland light delivery car is produced. This car carries regularly an open delivery body and a closed type. It has a load capacity of 1,500 pounds. The wheelbase is 93 inches and 34 by 4-inch tires are fitted on all wheels. An Exide forty-cell battery, giving a running radius of approximately 50 miles, is used. The



MODEL N BAKER OF 4,000 POUNDS CAPACITY



WAVERLEY'S 5-TON TRUCK WITH PLATFORM BODY



ATLANTIC VEHICLE CO.'S 5-TON TRUCK WITH TOP

motor is carried amidships and drives by double chains to the rear wheels. Six speeds are afforded by the controller, which with the steering lever is located on the left side.

CHAMPION

TWO models of standard electric commercial cars are manufactured by the Champion Electric Vehicle Co. They are of 750-1,000 pounds and 1-ton capacity, respectively. One novelty in their construction is the location of the battery, which is carried above the chassis frame, under the driver's seat. A battery of twenty-six cells, eleven-plate lead, or forty cells of Edison, is used on the 1,000-pound model; and on the 2,000-pound model, forty-four cells, thirteen-plate lead or sixty cells Edison are used.

The motor is suspended from the frame underneath the middle of the chassis, and drives through spur gears to a shaft, and from thence to the rear axle by bevel gears. The rear axle housing is of pressed steel. An option of chain-drive is offered on the larger model. In this form, the primary reduction is by Morse silent chain to a jackshaft, and from thence by roller chains to the rear wheels. The wheelbases of the two models are 86 and 100 inches, respectively.

C. T.

FOR 1913 the Commercial Truck Co. will produce six electric commercial chassis. They will range in capacity from 5 tons down to a quarter of a ton. The two smaller chassis, of 500 and 1,000 pounds capacity, respectively, have the motor sus-

pended beneath the chassis, and drive through a shaft to a worm-gear live axle. The 1 and 2-ton models have the motors supported on the rear axles, driving by spur gears to the wheels. The 3½ and 5-ton models are provided with four-wheel drive.

The two axles are forged of steel and are made in two sections, separated by a spacing member. The motors are held between arms on the axles, bosses on these arms being bored out to receive the trunnions, which constitute the supporting element of the motor casings. The motors drive through an internal gearing in the disk wheels. This permits equal distribution of the load over the four wheels, and doubles the tractive surface available.

All models steer from the left side, and have their controllers mounted on the steer-

SPECIFICATIONS OF ELECTRIC COMMERCIAL VEHICLES OFFERED FOR 1913

Name and Model	Price, Chassis Only	Body Style	Price with Body	Body Style	Price	Body Style	Price	Load, Capacity in Pounds	Width of Load Space in Feet	Height of Load Space in Feet	Length of Load Platform in Feet	Overall, Length in Feet	Wheel- base, Inches	TIRES		Body Weight in Pounds	Chassis Weight in Pounds	Turning Radius in Feet	
														Front	Rear				
Argo, K-10	\$1,700	Optional		Express	\$1,800			1,000	3.5		6.6		86	34x3	34x3	400	2,400		
Argo, K-20	2,100	Optional		Express	2,200			2,000	3.5		7.5		96	35x3½	35x3½	400	3,000		
Atlantic, 1 ton	2,400*	Optional						2,000	5.0		8.0		102	34x3½	34x4		4,400		
Atlantic, 2 ton	3,000*	Optional						4,000	5.0		10.5		114	34x4	36x3		5,700		
Atlantic, 3½ ton	3,500*	Optional						7,000	6.0		12.0		135	36x5	40x4		7,700		
Atlantic, 5 ton	4,000*	Optional						10,000	6.0		12.0		144	36x6	40x5		9,200		
Bailey, Service		Delivery						300	3.6	3.3	4.0		106	33x4	33x4				
Baker, W	1,700*	Open		Panel				500	Opt								2,085		
Baker, X	1,900*	Optional						1,000	Opt								2,650		
Baker, O	2,300*	Optional						2,000	Opt								3,125		
Baker, U	3,100*	Optional						4,000	Opt								5,200		
Baker, CC	3,500*	Optional						7,000	Opt								7,500		
Borland, Open Type		Open Truck	\$2,100	Closed	2,250			1,500	4.8	6.0			93	34x4	34x4				
C. T., 500-pound	1,800	Panel	2,000					500	3.5		5.5		85	36x2½	36x2½	350	2,600	19	
C. T., 1,000-pound	2,000	Panel	2,200					1,000	3.5		6.0		90 or 100	36x3½	36x3	400	3,100	20	
C. T., 1 ton		Panel	2,800					2,000	4.0		8.0		100	36x3½	36x4	600	3,900	21	
C. T., 2 ton	3,200	Express	3,500	Stake	3,500			4,000	4.2		11.0		116	36x5	36x3½	1,000	5,250	24	
C. T., 3½ ton	4,200	Express	4,500	Stake	4,500			7,000	5.0		12.0		115	36x3½	36x3½	1,250	7,000	24	
C. T., 5 ton	4,650	Express	5,000	Stake	5,000			10,000	5.5		15.0		132	36x4	36x4	1,500	8,000	26	
Detroit, 1	2,345	Express	2,520	Canvas top	2,590	Panel	\$2,730	1,000	3.8	4.6	6.5	11.0	80	32x2½	34x3		2,400		
Detroit, 2	2,870	Express	3,080	Canvas top	3,150	Panel	3,310	2,000	3.9	4.6	6.9	11.5	84	32x3	34x3½		2,900		
Detroit, 3	3,132	Optional		Canvas top				3,000	4.3	Opt	Opt		96	34x3½	36x4		3,700		
Detroit, 7	5,000	Optional						7,000	Opt	Opt	Opt	19.0	132	36x5	36x4		8,115		
Fritchle, Commercial	2,000	Delivery						1,000					100	32x3½	32x3½				
G. V., 750-pound	1,080	Delivery						750	3.3	4.4	4.9	9.9	76	32x2½	32x2½		2,460		
G. V., 1,000-pound	1,370	Delivery						1,000	3.4	5.0	6.0	10.9	87	36x2½	36x2½		3,090		
G. V., 1 ton	1,710	Delivery						2,000	4.0	5.5	8.0	12.5	102	36x3½	36x3½		3,985		
G. V., 3½ ton	2,620	Express						7,000	5.0	6.0	13.0	16.5	128	36x6	36x3½		7,500		
G. V., 5 ton	2,950	Express						10,000	6.0	6.0	15.0	18.5	139	36x7	36x5		8,450		
Jatco, C	1,800	Express	2,000	Panel	2,100			2,000	3.9		7.3	10.9	84	32x3	32x3	250	2,600		
Jatco, D	1,400	Express	1,500	Panel	1,600			1,000	3.9		7.3	10.9	84	34x3½	34x3½	300	3,000		
Lansden, 1,000-pound	2,300	Platform	2,450	Express	2,550	Panel	2,675	1,000	3.9	5.5	7.6	11.8	96	36x2½	36x2½	550	2,200	16	
Lansden, 1 ton	2,775	Express	2,925	Express	3,050	Panel	3,175	2,000	3.9	5.6	9.5	13.9	106	36x3	36x3	600	3,400	17	
Lansden, 2 ton	3,570	Platform	3,820	Express	3,920	Panel	3,995	4,000	4.1	5.8	11.0	15.3	120	36x4	36x3	800	5,200	18	
Lansden, 3½ ton	4,390	Platform	4,690	Express	4,790	Panel	4,890	7,000	4.5	6.0	12.0	16.5	130	36x5	36x3½	1,200	6,800	20	
Lansden, 5 ton	5,090	Platform	5,390	Express	5,490	Panel	5,640	10,000	4.8	6.0	13.5	17.3	142	36x6	36x4	1,500	8,500	23½	
M. & P., 1,500-pound	1,450	Express	1,500	Closed	1,600			1,500	3.5		6.7	11.3	100	30x3	30x3	700	2,700		
M. & P., 2,500-pound	1,850	Open	1,900	Closed	2,000			2,500	3.8		7.7	12.5	112	34x3	34x3	900	3,200		
Urban, 10	1,250	Express	1,800	Panel	1,900			1,000	3.5	4.8	6.0		86	36x3	36x3	500	1,900	38	
Urban, 20	1,600	Express	2,300	Panel	2,400			2,000	4.2		8.0		100	36x3½	36x4	750	3,300	44	
Urban, 40	2,200	Platform	3,000	Express	3,100	Panel	3,200	4,000	5.7		10.9		118	36x4	36x3	1,000	4,200	50	
Urban, 70	2,800	Platform	3,800	Express	3,900	Panel	4,000	7,000	6.3		12.0		130	36x5	36x4	1,200	5,600	54	
Walker, G & F		Optional						1,000											
Walker, C		Optional						1,500											
Walker, B		Optional						3,000											
Walker, D		Optional						5,000											
Walker, E		Optional						7,000											
Ward, E. B		Express		Panel		Screen		2,000	3.8	5.0	8.0	11.5	96	34x4	34x4	800	4,800	20	
Ward, E. D		Express		Panel		Screen		8,000	4.5	6.5	12.0	15.5	132	36x6	36x4	2,300	8,000	28	
Ward, E. C		Express		Panel		Screen		4,000	4.0	5.5	9.5	13.0	114	36x5	36x3	1,200	5,500	24	
Ward, E. A		Express		Panel		Screen		1,000	3.5	4.5	6.5	10.0	84	34x3	34x3	500	2,500	17	
Waverley, 1,000-pound		Panel						1,000	3.6	4.6	6.0		91	34x2½	34x2½	450	2,975	32	
Waverley, 2,000-pound		Optional						2,000					108	34x3½	34x3½	1,000	3,400	36	
Waverley, 2 ton		Optional						4,000					114	36x4	36x3	1,500	6,300	44	
Waverley, 3½ ton		Optional						7,000					6.5	127	36x6	36x3½	1,750	7,250	50
Waverley, 5 ton		Optional						10,000					18.0	136	36x7	36x5	2,000	9,700	62

NOTE *Price with lead battery; d Weight without battery.
ABBREVIATIONS:—Opt, Optional loading space.

ing column, beneath the wheel. The four lighter models are equipped with hollow box-shaped pressed steel front axles, the other types using the I-beam.

The controller that is used on each of these trucks is at the base of the steering column, and is operated by the sleeve on the pillar, to which is secured a wheel, beneath the steering wheel. Three forward speeds are afforded on the 500 and 1,000-pound models, while on the larger, four speeds are provided, which meet all the driver's requirements.

DETROIT

YEARLY models are not produced by the makers of the Detroit electric, the same line of four commercial chassis as was offered last season being continued for

the season of 1913. These are of 1,000 pounds, 1 ton, 1½ tons, and 3½ tons capacity. Edison batteries are regularly featured on these cars, and all models are of the conventional type, chain-driven with the battery suspended below the frame.

Wheel steer, with the controller-handle on the wheel is used in the control of the cars, the steering pillar being located on the left side. The battery is suspended on each model in an underhung cradle, consisting of a number of roller trays. These trays are disposed on a metal track, so they may be slid out at the side. One man can remove the battery for inspection and cleaning, by removing the side covers, affixing the tracks, and suspending the outer corners from the side of the body by cables, and sliding the trays out on the shelves so formed. The motors are sus-

pended from the frame by strap arms, and drive to the jackshaft by silent chains.

FRITCHLE

HAILING from Denver, the Fritchle delivery car appears in but one model. This model has an open delivery body, and is adapted to a load of 1000 pounds. The wheelbase is 100 inches, and the tires are 32 by 3½, front and rear. The Fritchle thirty-two-cell battery and Fritchle motor are used, the latter being suspended beneath the chassis, and driving to the rear wheels by chains.

G. M. C.

COMPRISED eight models of different capacities, the General Motors Truck Co.'s line of commercial electric vehicles is very complete, ranging as it does from

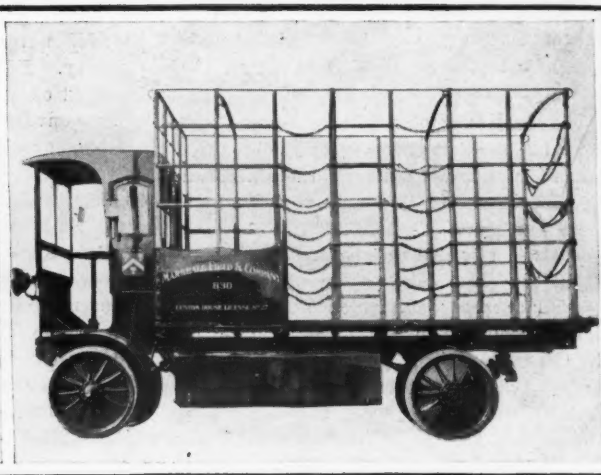
SPECIFICATIONS OF ELECTRIC COMMERCIAL VEHICLES OFFERED FOR 1913

Turning Radius in Feet	BATTERY			MOTOR			Right or Left Steer	Location of Control Lever	Number Forward Speeds	Drive	Total Weight Chassis & Body	SPRINGS		Front Axle	Weight Over Front Wheels	Weight Over Rear Wheels
	Make and of Cells	No.	Ampere Hour Cap.	Miles per Charge	Make	Type	Location					Front	Rear			
	Opt, 28, 40, 60.	135 or 162	40-50	Westinghouse	Series	Unit with rear axle	Left	Under wheel	4	Bevel	2,800	½ Ell	½ Ell	Tubular		
	Opt, 30, 40, 60.	162 or 185	40-50	Westinghouse	Series	Unit with rear axle	Left	Under wheel	4	Bevel	3,400	½ Ell	½ Ell	Tubular	2,000	3,000
	Opt, 44, 60		55-60	Gen Electric	Series	Over rear axle	Left	Left of seat	4	Chain		½ Ell	½ Ell	I-Beam		
	Opt, 44, 60		50	Gen Electric	Series	Over rear axle	Left	Left of seat	4	Chain		½ Ell	½ Ell	I-Beam		
	Opt, 44, 60			Gen Electric	Series	Over rear axle	Left	Left of seat	4	Chain		½ Ell	½ Ell	I-Beam		
	Opt, 44, 60			Gen Electric	Series	Over rear axle	Left	Left of seat	4	Chain		½ Ell	½ Ell	I-Beam		
	Edison, 60	150	60-80	Gen Electric	Series	Under chassis	Left	Top of wheel	6	Chain	2,200	½ Ell	½ Ell	I-Beam		
	Lead, 30		75	Gen Electric	Series	Under chassis	Left	Under wheel	6	Chain		½ Ell	½ Ell	Tubular		
	Opt, 42, 60		50	Gen Electric	Series	Under chassis	Left	Under wheel	5	Chain		½ Ell	½ Ell	I-Beam		
	Opt, 42, 60		50	Gen Electric	Series	Under chassis	Left	Under wheel	5	Chain		½ Ell	½ Ell	I-Beam		
	Opt, 42, 60		50	Gen Electric	Series	Under chassis	Left	Under wheel	5	Chain		½ Ell	½ Ell	I-Beam		
	Opt, 42, 60		50	Gen Electric	Series	Under chassis	Left	Under wheel	5	Chain		½ Ell	½ Ell	I-Beam		
	Exide, 40	116	50	Gen. Electric	Series	Amidships	Left	Under wheel	6	Chain		½ Ell	½ Ell	I-Beam	750	750
	Opt, 42, 60			Gen Electric	Series	Under chassis	Left	Under wheel	3	Worm		½ Ell	½ Ell	Box	1,840	2,760
	Opt, 42, 60			Gen Electric	Series	Under chassis	Left	Under wheel	3	Worm		½ Ell	½ Ell	Box	1,840	2,760
	Opt, 42, 60			Gen Electric	Series	On axle	Left	Under wheel	4	Spur	4,500	½ Ell	½ Ell	Box	2,600	3,900
	Opt, 42, 60			Gen Electric	Series	On axle	Left	Under wheel	4	Spur	6,800	½ Ell	½ Ell	Box	4,200	6,300
	Opt, 42, 60			Gen Electric	Series	On axle	Left	Under wheel	4	Spur		½ Ell	½ Ell		10,000	10,000
	Opt, 42, 60			Gen Electric	Series	On axle	Left	Under wheel	4	Spur	10,000	½ Ell	½ Ell		10,000	10,000
	Edison, 60	150	55	Own	Series	Rear of battery	Left	On wheel	5	Chain		½ Ell	½ Ell	I-Beam	1,350	2,650
	Edison, 60	225	55	Own	Series	Rear of battery	Left	On wheel	5	Chain		½ Ell	½ Ell	I-Beam	1,140	2,385
	Edison, 60	225	50	Own	Series	Rear of battery	Left	On wheel	5	Chain		½ Ell	½ Ell	I-Beam	3,080	4,620
	Edison, 60	375	40	Own	Series	Rear of battery	Left	On wheel	5	Chain		½ Ell	½ Ell	I-Beam	6,956	10,434
	Own, 32			Own	Comp.	Under chassis	Left	Left of seat	5	Chain		Ell	Ell	Solid		
	Opt, 44	104		Gen Electric	Series	Amidships	Center	Left	4	Chain		½ Ell	½ Ell			
	Own, 44	138		Gen Electric	Series	Amidships	Center	Left	4	Chain		½ Ell	½ Ell			
	Own, 44	162		Gen Electric	Series	Amidships	Center	Left	4	Chain		½ Ell	½ Ell			
	Own, 44	270		Gen Electric	Series	Amidships	Center	Left	4	Chain		½ Ell	½ Ell			
	Own, 44	324		Gen Electric	Series	Amidships	Center	Left	4	Chain		½ Ell	½ Ell			
	Opt, 30	165	50	Westinghouse	Series	Under chassis	Left	Top of wheel	4	Chain	2,850	½ Ell	½ Ell	I-Beam		
	Opt, 40	165	40	Westinghouse	Series	Under chassis	Left	Right of seat	4	Chain	3,300	½ Ell	½ Ell	I-Beam		
	Edison, 60	150	60	Gen Electric	Series	Under frame	Left	Under wheel	4	Chain	2,750	½ Ell	½ Ell	I-Beam	1,500	2,250
	Edison, 60	225	60	Gen Electric	Series	Under frame	Left	Under wheel	4	Chain	4,000	½ Ell	½ Ell	I-Beam	2,700	3,500
	Edison, 60	300	50	Gen Electric	Series	Under frame	Left	Under wheel	4	Chain	6,000	½ Ell	½ Ell	I-Beam	4,500	5,500
	Edison, 60	375	50	Gen Electric	Series	Under frame	Left	Under wheel	4	Chain	8,000	½ Ell	½ Ell	I-Beam	6,750	8,250
	Edison, 60	450	50	Gen Electric	Series	Under frame	Left	Under wheel	4	Chain	10,000	½ Ell	½ Ell	I-Beam	9,000	11,000
	Gould, 40	130	40	Westinghouse	Series	Under seat	Left	Left	4	Chain	3,400	Ell	Ell	I-Beam		
	Gould, 40	170	50	Westinghouse	Series	Under seat	Left	Left	4	Chain	4,100	Ell	Ell	I-Beam		
	Exide, 30	165	40	Gen Electric	Series	Under chassis	Left	Under wheel	4	Chain	2,400	½ Ell	½ Ell	I-Beam	1,850	2,550
	Exide, 44	165	40	Gen Electric	Series	Under chassis	Left	Under wheel	4	Chain	4,050	½ Ell	½ Ell	I-Beam	2,800	4,548
	Exide, 44	220	35	Gen Electric	Series	Under chassis	Left	Under wheel	4	Chain	5,200	½ Ell	½ Ell	I-Beam	3,800	7,975
	Exide, 44	275	35	Gen Electric	Series	Under chassis	Left	Under wheel	4	Chain	6,800	½ Ell	½ Ell	I-Beam	5,500	11,500
	Opt, 40, 60			Series	Unit with rear axle	Left	Left of seat	4	Int G.			½ Ell	½ Plat	I-Beam		
	Opt, 42, 60			Series	Unit with rear axle	Left	Left of seat	4	Int G.			½ Ell	½ Plat	I-Beam		
	Opt, 42, 60			Series	Unit with rear axle	Left	Left of seat	4	Int G.			½ Ell	½ Plat	I-Beam		
	Opt, 44, 60			Series	Unit with rear axle	Left	Left	6	Int G.			½ Ell	½ Plat	I-Beam		
	Opt, 44, 60			Series	Unit with rear axle	Left	Left	6	Int G.			½ Ell	½ Plat	I-Beam		
	Opt, 42, 60	140	40-50	Gen Electric	Series	Rear	Left	Left	4	Chain	5,600	½ Ell	½ Ell	Solid	2,900	4,800
	Opt, 42, 60	252	30-35	Gen Electric	Series	Rear	Left	Left	4	Chain	10,300	½ Ell	½ Ell	Solid	5,900	12,600
	Opt, 42, 60	196	35-45	Gen Electric	Series	Rear	Left	Left	4	Chain	6,700	½ Ell	½ Ell	Solid	3,700	8,000
	Opt, 42, 60	112	45-60	Gen Electric	Series	Rear	Left	Left	4	Chain	3,000	½ Ell	½ Ell	Solid	1,500	2,500
	Opt, 42	135	50	Own	Series	Under chassis	Left	Left	4	Bevel	3,425	Ell	Ell	I-Beam	1,740	2,685
	Opt, 42	189	50	Own	Series	Under chassis	Left	Left	4	Bevel	4,400	½ Ell	½ Ell	I-Beam	2,400	4,000
	Opt, 42	216	45	Optional	Series	Under chassis	Left	Left	4	Chain	7,800	½ Ell	½ Ell	I-Beam	3,900	7,900
	Opt, 42	270	40	Optional	Series	Under chassis	Left	Left	5	Chain	9,000	½ Ell	½ Ell	I-Beam	6,000	10,000
	Opt, 42	324	35	Optional	Series	Under chassis	Left	Left	5	Chain	11,700	½ Ell	½ Ell	I-Beam	8,070	13,610

ABBREVIATIONS:—Opt, either lead or Edison battery; Comp, compound-wound generator; Ell, semi-elliptic springs; Ell, elliptic springs; ½ Ell, three-quarter elliptic springs; Bevel, shaft drive with bevel gear reduction; Worm, shaft drive with worm gear reduction; Spur, direct drive from armature shaft through spur gear in wheel.



KENTUCKY WAGON CO.'S MODEL 70 3 1/2-TON TRUCK



WALKER 3 1/2-TON ELECTRIC TRUCK



DETROIT FITTED WITH PASSENGER BUS BODY

1/2 to 6 tons in capacity. The trucks in the order of their carrying capacity are: Model 1, 1,000 pounds capacity; model 2, 2,000 pounds capacity; model 3, 3,000 pounds capacity; model 4, 4,000 pounds capacity; model 6, 6,000 pounds capacity; model 8, 8,000 pounds capacity; model 10, 10,000 pounds capacity, and model 12, 12,000 pounds capacity.

These models are each subdivided into

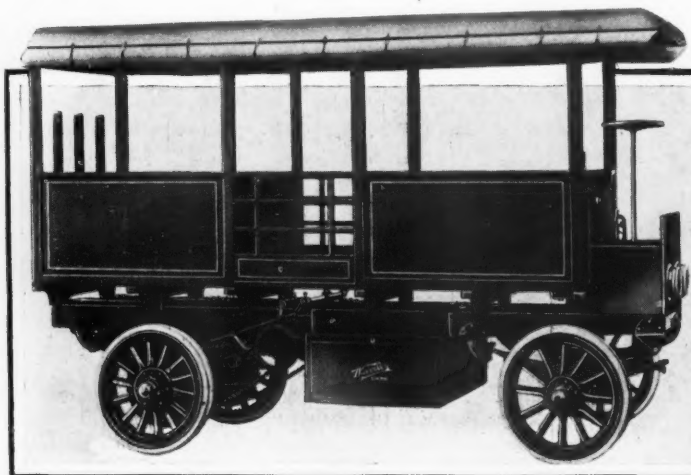
three types, type A, short wheelbase; type B, medium wheelbase; and type C, long wheelbase. A number of original features are to be noticed in the make-up of these cars. One of these is a spring-steel blade propeller shaft to transmit the power from the motor to the countershaft. This form of drive is equally as positive as a rigid shaft, with the additional advantage of cushioning shocks, absorbing

vibration, and immunity to harmful results should an abnormal strain be exerted upon the shaft.

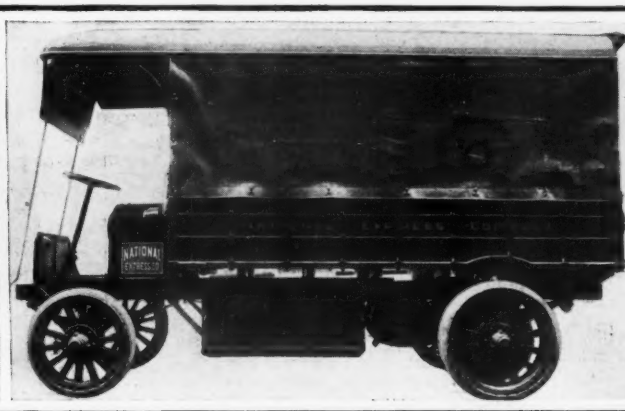
Another feature is a short hood at the front, inclosing the controller, ampere-hour meter, and switches. The battery on this truck is placed on top of the chassis frame, beneath the driver's seat. All models carry either a forty-cell lead battery or a sixty-cell Edison. The batteries are removable through the side panels of the seat, and may be inspected by raising the seat cover. A lever on top of the steering wheel controls the car through a lever on the bottom of the controller rod inside the steering pillar. The motor drives to the jackshaft by means of the spring-steel blade, being located behind the jackshaft. Final drive is through side chains. Semi-elliptic springs are used all around, with coil helpers in the rear.

GENERAL VEHICLE

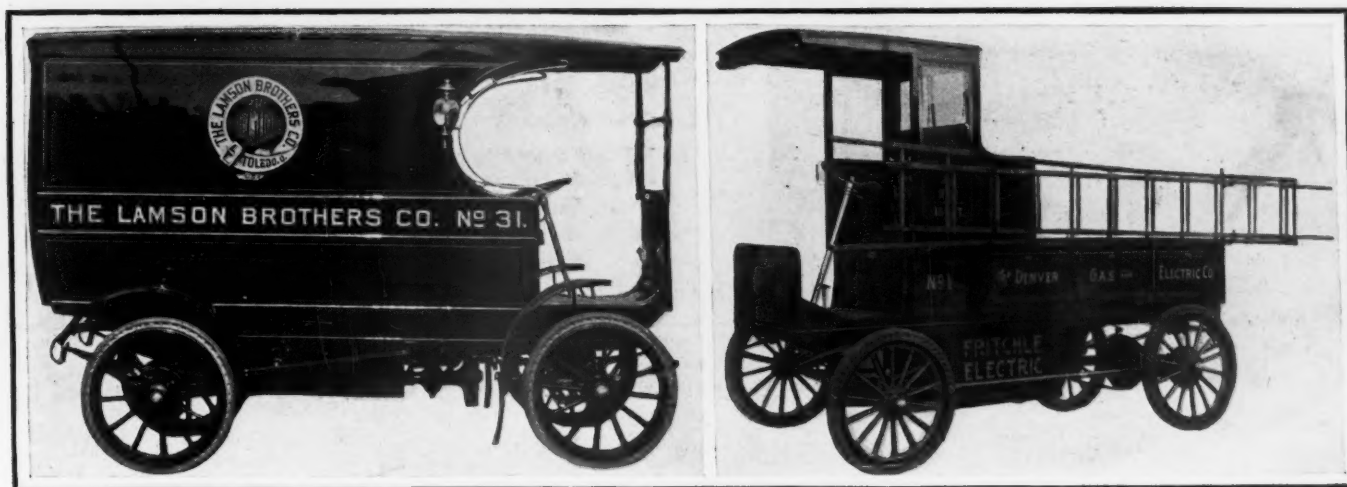
SIX models of General Vehicle electric trucks are made for 1913. These show practically no departures from former practice, and range in capacity from 750 pounds to 10,000 pounds. Each model is constructed on the same structural plan, such differences as exist being the result of the difference in strains that are to be imposed upon them. The same battery of forty-four cells is used on all models, being



ATLANTIC VEHICLE CO.'S 3 1/2-TON MODEL WITH PLATFORM BODY



WAVERLEY OF 2-TON CAPACITY FOR EXPRESS SERVICE



OHIO ELECTRIC 1,000-POUND LIGHT DELIVERY

FRITCHLE SPECIAL DESIGN PUBLIC SERVICE WAGON

suspended from the main frame, beneath the middle of the car. The cradle is arranged so that the battery may be removed from either side. The controller, located beneath the driver's seat, is operated by a lever at the side, while the motor is suspended from the frame, behind the battery box, driving to the jackshaft by a silent chain, from whence the drive is taken by the wheels through double roller chains.

JATCO

OF 1 and 1½-ton capacity, respectively, Jatco electric motor trucks are presented in two models for 1913. Both models are alike in not only general construction, but in general dimensions. They differ in weight and the loads they will

sustain. The weight of the 1,000-pound model is 2,600 pounds, while that of the 2,000-pounder is 3,000 pounds. The smaller model carries thirty cells, and the larger a forty-cell battery, in a cradle suspended beneath the middle of the chassis. Behind this, the jackshaft is driven by a silent chain from the motor, and drives the wheels by double roller chains.

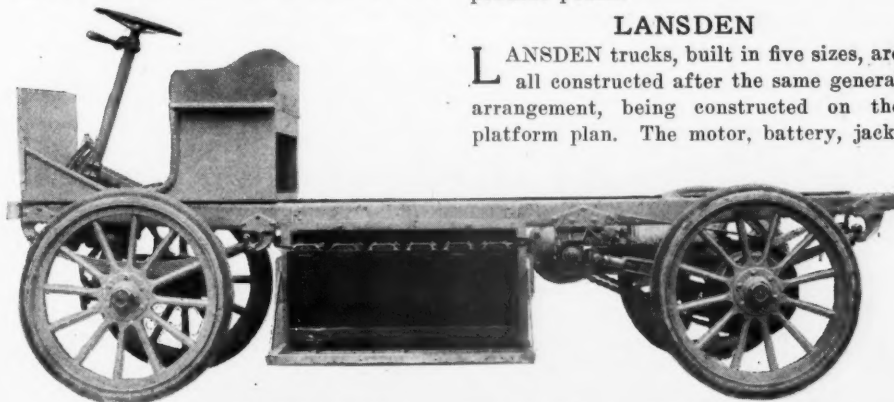
These batteries are each of 165 ampere-hours capacity, and afford a running radius of 50 miles per charge on the smaller model, and 40 miles per charge on the larger. The smaller model is controlled by a lever on top of the steering wheel, while the larger is operated by means of a lever at the side of the seat. Brakes are controlled by independent pedals.

LANDSEN

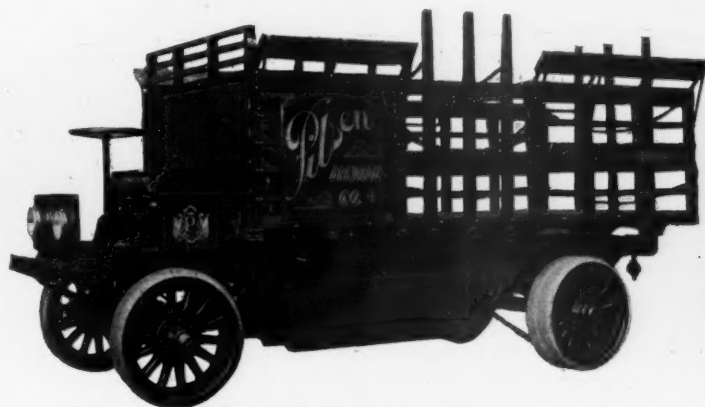
LANDSEN trucks, built in five sizes, are all constructed after the same general arrangement, being constructed on the platform plan. The motor, battery, jack-

shaft, resistance boxes, and controller being beneath the chassis frame, the space above it being devoted entirely to the driver's seat and load platform. The models range in capacity from 1,000 pounds to 5 tons. Each is provided with Edison batteries exclusively, suspended from the middle of the chassis in a steel cradle, covered with aluminoid. The inside is lined with insulation, while the sides are hinged at the bottom, and may be folded down to form shelves. On these shelves the battery may be drawn out for cleaning and inspection, their trays being mounted on rollers which run on steel tracks. This permits cleaning, inspection, or even complete removal of the battery without disturbing the load, or any other part, and with no lifting.

The 1,000-pound model has sixty cells, arranged in ten rows, six in each, while the other models have twelve rows, with five in each. The controller is mounted under the front floor-boards, and is operated by a gear connected with a movable sleeve about the steering column, operated by a lever under the wheel. In operation four notches forward of neutral give the four forward speeds, while two reverse speeds are afforded by a backward motion of the lever. Inadvertent reversal is prevented by a raise in the slot in which the lever moves, which obliges the operator to raise the lever slightly to pass into reverse posi-



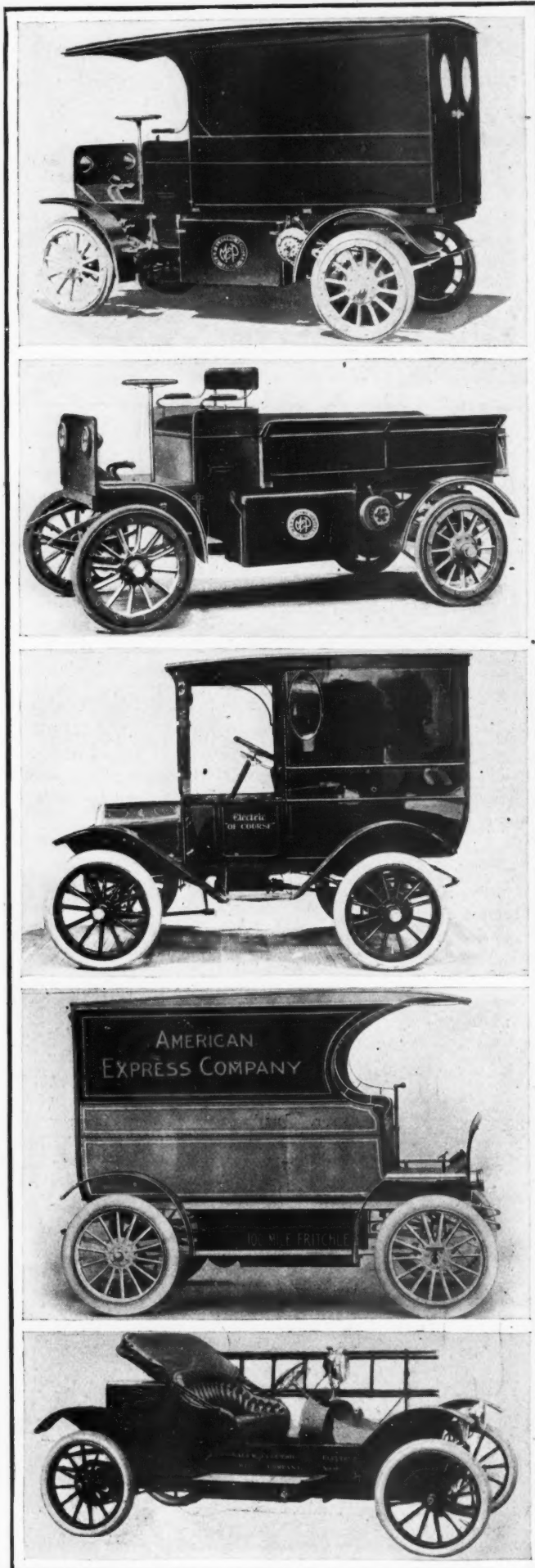
CHASSIS OF THE LANDSEN ELECTRIC TRUCK



ONE-TON OHIO USED BY BREWERS



BAKER 2,000-POUND TRUCK CARRYING BEER



tion. The motor is mounted slightly forward of the rear axle, being suspended from the frame on three points, it drives the jackshaft by means of a shaft and bevel-gears, final drive to the wheels being by double side chains.

M AND P

NO new models of M and P commercial electrics will be produced for 1913, but the 1,500-pound and 2,500-pound models are continued without regard to season. The first of these has a wheelbase of 100 inches and 30 by 3-inch tires all around. A Gould forty-cell 130-ampere-hour battery is used, which affords a running radius of 40 miles per charge.

The car is built with a straight frame, with the seat at the extreme front end, and the battery beneath the chassis frame in the center of the car. The motor, under the seat, drives by a propeller shaft to a jackshaft at the rear. Drive to the wheels is by double chains.

Special features of this truck are: The wires are short, the longest being 3 feet in length. The battery is divided in the middle, two trays being located on either side of the propeller shaft. Each tray carries ten cells, and may be removed from the side by one man, without lifting. Elliptic springs all around support the chassis. The larger model differs from the smaller in its greater capacity, a 112-inch wheelbase, 34 by 3-inch tires, and in the capacity of its battery. This battery is of 170-ampere-hours capacity, which will drive the car 50 miles per charge, it is said.

URBAN

MANUFACTURED by the Kentucky Wagon Mfg. Co., Urban electric commercial cars are produced in four 1913 models. Model 10 is a light delivery wagon of 1,000 pounds capacity, model 20 a light truck of 1 ton capacity, model 40, 2-ton size, and model 70, the heaviest, of 3½ tons capacity. All four models are built on conservative lines, and each on the same general scheme.

The battery is hung beneath the frame, and the power of the motor is transmitted by a chain to the jackshaft, and by chains from thence to the rear wheels. Suspension is by four semi-elliptic springs, and drive is from the extreme forward end of each model. An inclined hand wheel controls the steering, while a pedal and side-lever, respectively, control the brakes. The motor is controlled by a controller located in a closed forward shroud dash, a lever in a double-slotted gate segment being used to operate it. The battery box is arranged to slide out at the side.

All models are regularly equipped with express and panel bodies, while the two larger types also are equipped with platform stake bodies for heavy trucking work. Especial stress is laid on the manner in which the component parts are balanced, which results in the proportionate load on the front and rear wheels remaining the same regardless of whether loaded or empty.

WALKER

NO changes of consequence have been made in Walker commercial electrics since their inception. Their feature, the motor location and drive is retained. Load capacities of from 1,000 to 7,000 pounds are offered in the five-chassis line. All bodies are built to conform to the requirements of the individual purchaser. The sizes of the bodies may be also varied to suit the desires of the user.

Wheelbases and loading spaces are subject to a wide variance, as the motive element is a separate unit, the motor being contained in the hollow rear axle and driving through a differential to planetary gears contained in the disk-type rear wheels. Rear spring hangers may be adjusted to any length of frame. This planetary gear consists of a small spur pinion secured to the drive-axle, and meshing with two large planetary gear-wheels, which are rigidly mounted on a stationary spider. These gears mesh with an internally-toothed gear-ring on the rim of the wheel. The wheels are built up of two ribbed plates, which inclose the gearing and support the wheel load on separate bearings.

The smallest models, F and G, are of 1000 pounds capacity.

From top to bottom—M and P closed body type; M and P panel body; Baker light delivery; Fritchle with closed body; Bailey street light maintenance wagon

They differ in that in the first, known as the Marshall Field type, has its battery suspended beneath the middle of the chassis, and the seat located at the extreme front, while the latter, known as the Mandel Brothers type, has the battery disposed mainly in a bonnet at the front, and in a cradle at the rear.

They are alike in the use of half-elliptic front springs and three-quarters elliptic rear. Four speeds forward, as controlled by a side-lever on the left side of the car, are afforded, and 34 by 3-inch rear tires are fitted. Model F has 32 by 3-inch front tires, and model G, 34 by 3. The other models are all of the Marshall Field type, model C, of 1500 pounds capacity, having 34 by 3-inch front tires and 38 by 3-inch rear. Model C, of 3000 pounds capacity, has 36 by 3½-inch front tires, and 42 by 3½ or 36 by 5-inch rear tires, on option. Models D and E are similar to the lighter models, except that six speeds are provided instead of four. Model D has 36 by 5-inch front tires and 36 by 3½-inch dual rear tires, and those of the 7000-pound model E are 36 by 6 and 36 by 4 dual, respectively.

An especial feature that is advanced in favor of these trucks is the balanced drive afforded by the form of gearing used, by which the power is transmitted in a straight line, through idler gears which balance the drive on opposite sides of the wheel. Another feature of interest is the front suspension. Two transverse semi-elliptic springs are used, being secured to one another at their middles, and shackled to the body and axle, respectively, at their ends. This form of spring is more commonly known as an X spring.

WAVERLEY

FORMERLY the Waverley interests were represented by but one model in the electric commercial field, but for 1913 four models have been added, so the complete line now comprises five chassis of from 1,000 to 10,000 pounds capacity. The new trucks are a 1,000-pound delivery car, which drives direct to the live rear axle by bevel gears, carries its battery underneath, is fitted with four elliptic springs, and wheel steer; a 2-ton truck, which has its motor suspended from the rear of the chassis and drives by a shaft to the countershaft in front of the drive wheels, from which the drive is to the rear wheels by double side-chains, is suspended on half-elliptic springs, and has dual rear tires; a 3½ and a 5-ton model, built on the same lines as the 2-ton model, but of larger sizes.

The 1-ton model, carried over from last year, is similar to the new 1000-pound model, except that half-elliptic springs are used instead of the elliptic type. Body types are optional on all models, except the 1000-pound model, which has a panel body.

All models have forty-two-cell batteries, the number of plates varying with the sizes of the trucks. The battery cradles are constructed of steel, strongly braced and steadied by steel guys, and T-rail hoops. Drum-type, continuous-torque controllers are used, located under the seats.

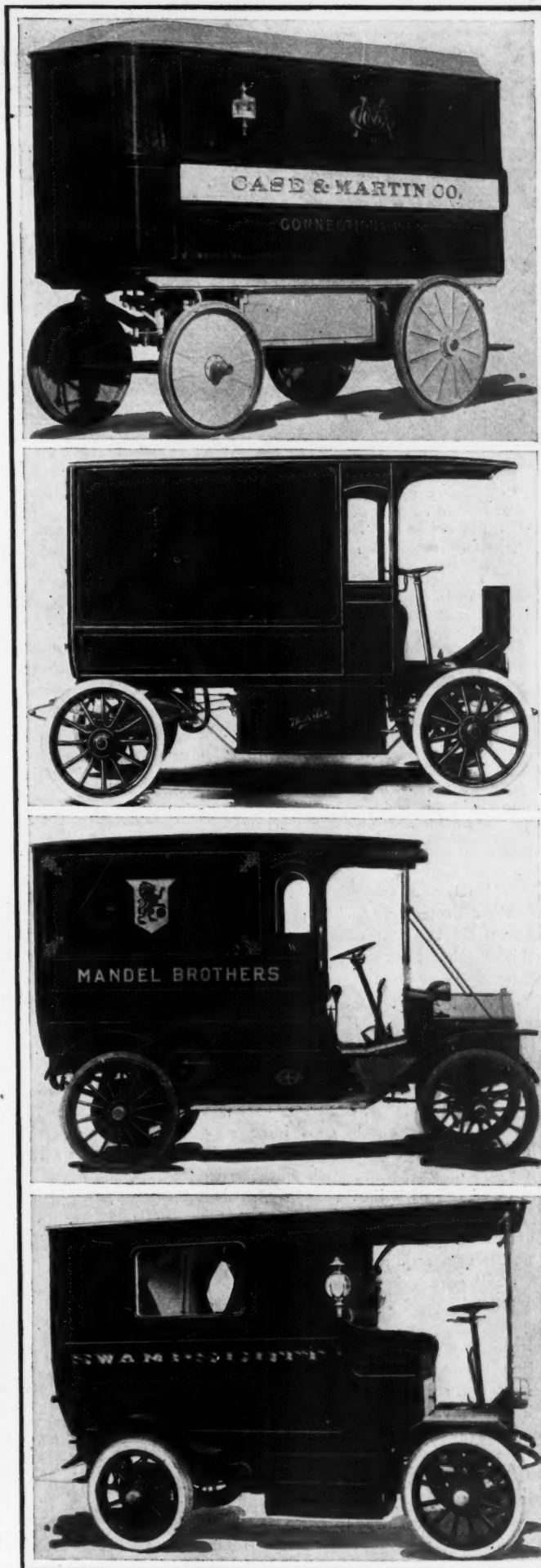
WARD

CONSISTENT uniformity is the characteristic feature of the Ward line of trucks. These trucks have been developed along the same lines for nearly a decade, and are standard throughout. Four models from 1 to 4 tons are built, every part of which is uniform in design, except as to size.

These models are new, in that they have been completely redesigned over those of last year, but in fundamentals, they are in strict conformance with former types.

In the Ward chassis every part is below the chassis frame. The motors are located at the rear of the chassis, and drive from the motor to the jackshaft by a silent chain and to the wheels through double chains. The battery is located in an underhung cradle at the middle of the car. Suspension is by semi-elliptic springs all around, and control is from the extreme front, by a steering wheel on the left side, a foot pedal, and a control lever at the side. This lever operates a drum-type, continuous-torque controller, affording four speeds forward and two reverse. It is located under the seat.

From top to bottom—Walker with pie delivery body; Waverley 1,000-pound model; Kentucky 1,000-pound model, Baker 2,000-pound model





RELATION OF CUSTOMER TO CAR

By William B. Stout

WHAT is the best method for keeping track of cars and shop work in an electric garage?

What are the essential forms to be used in conducting the business of a garage handling electric cars which will take care of all leaks, give the best mechanical results and the best service all around?

Is the system I am using at present in my garage complete enough or are there points of weakness developing which may become serious as my business grows if not noted and acted upon in time?

Shall I wait and let the system grow with the business or is it important that I plan the conduct of the shop from the first with the idea of a large growth in mind so that the system will fit no matter how business increases?

GARAGE men are asking these questions among themselves and seeking information, the first effort being to find out how other men are solving the same problems. How is X doing it in New Orleans, or what forms are used by Y in Denver?

It is a fact that the forms used in one garage will not entirely fill the case of another in a different location or in a different class of service, but from each set of forms used by others good ideas may be gleaned so when one has absorbed what others are doing he can with more assurance go ahead with the ideas just learned as a more understanding basis of judgment in figuring out the blanks and forms to fit his own requirements.

A small garage handling only one kind of work will need fewer forms of course than a large plant serving all classes of custom. One garage may be located in a section where but one kind of work is encountered, such as motor truck garaging with cars leaving and returning at certain times of the day, or it may be merely pleasure cars for milady.

With some the charging plant for the batteries is run by the garage and in others is operated by a separate firm. Some firms furnish operators for their cars for special occasions and if so there

must be a system of keeping track of this branch. Every phase of the business must have a method of keeping record of every move and every expenditure of time, money or brains.

So far as battery charging goes there will be a system with its blanks of forms to take care of the inspections and overhauls, the overcharge, the charging and condition of battery cells, current consumption and the like.

Garage work may properly be divided into four branches and whatever forms are provided must cover the demands of each section. These four classes of forms take care of:

- 1—The relation of the customer to his car.
- 2—The relation of the car to the shop.
- 3—The relation of the shop to the office, and
- 4—The relations of the office to the customer.

Thus the four branches form, as it were, a hollow square, the corners being customer, car, shop and office, with the forms circulating in this order.

Relation of Customer to Car

In the first branch of garage work there must be a record kept of all happening to the car in relation to the customer. There must be a daily record of when cars go out and when they come in. With this it were well to include a record of what the customer accomplishes with the car each day, the mileage and current consumption, with even a statement of the

weather as well to enable the firm to figure if batteries are giving mileage service suited to weather, road and temperature conditions. Again there is need of a record of the condition of the car when it goes out. What amount of current is in the batteries, is there a lap robe in the car, or are there cut-glass vases for flowers? To prevent loss or dispute a record should be had of what each car contains.

There may be further records made necessary by local conditions and not listed here, but they come under the first department, giving to the garage a complete record.

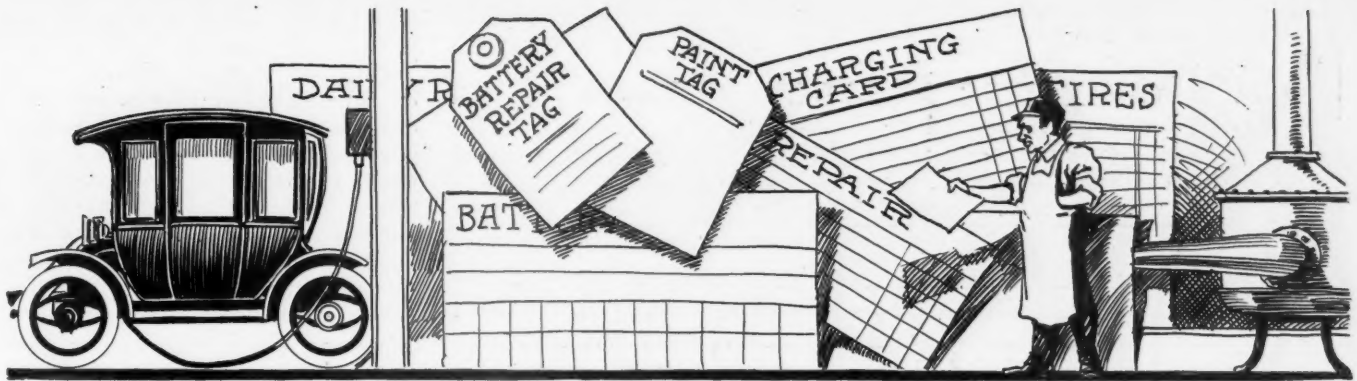
Records Should Be Kept

To get this record there must be blanks to be filled out. These may be many or few, but the system of forms will be best in the ordinary case which is simplest, which contains the fewest printed forms to do the work, and which are set down in a way not to be confusing to the mind of the average man who will have to do the filling out. They should obtain some sort of a report from each man connected with the job, furnishing when complete a full set of information covering every contact of the car and owner.

The second department, as it might be called, covers the relation of the car to the shop. When a car comes into the shop for repair there must be some instructions with it. This calls for tags to attach to the car containing instructions: tire tags, battery tags, general repair tags, charging tags and the like. These are to cover the reason for the car's entrance into the shop and the repairs as they progress.



RELATION BETWEEN SHOP AND OFFICE



RELATION BETWEEN CAR AND SHOP

With these comes a listing of the shop foreman every day of the number of cars in the shop and the state of the repair in progress. There also might be included in the shop form, even though it is later turned into the office as a report, the form used by the battery-charging man as he takes readings on the battery conditions of each car every hour while they are charging or overcharging. This form is really a part of the car's relation to the shop.

Next comes the branch having generally the most blank forms of any, the relation of the shop to the office. In this case the forms are mostly reports of work done: time sheets or slips of workmen, reports of foremen, report of battery charger, reports on battery repairs, requisitions for material, repair slips, etc., together with forms for the weekly battery reports made out from the daily reading slips of the battery man. These and many others dealing with the purchasing department as well cover the ground between the shop and office.

Noting Condition of Trucks

When a car comes in from the road it must be washed. This is reported on a blank form and if polished as well additional marks are made. An inspection of the car is made by a garage man who on another blank lists the condition of chains, body, wheels, tires, springs, etc. On a separate form is reported battery condition and whether charging is needed.

A man tightens the chains, or adjusts the steering gear. His time and the name of the job is listed on another form or time slip containing columns for all information the office needs in regard to the work done on the car. In a large garage other forms will be used back to the tool room

to cover tools taken out and returned and by whom, and other routine of a large shop. This will hardly be so in a small garage.

Recording Tire History

A tire on the vehicle is worn out. The report of this being in and a new tire needed a blank dealing with the tire's history is gotten out and notation made of the final demise of the member. This card has on it a complete record of that tire from the time it came into the shop, with labor and material expended on it listed perhaps on the back of the card, so that now that the tire is used up there is a detailed record of what that tire accomplished with mileage cost, time in service and all listed. When a new tire is put on a new card is filled, describing it in detail, with the price, and giving the date it was put on. Tires being such an important part of vehicle operation expense, many firms consider it necessary to keep a separate tire record.

The car may need charging. If so the battery man has another blank to fill out, related solely to his charging operation. This will give the volts, specific gravity of the electrolyte and details as to time, in the battery room. In some garages a single card follows the car through, covering the washing operation, polishing, electrical inspection, charging record and the detailed inspection of separate cells. If there is a loose connection or any battery repair work as separate from charging this may take another blank, but there would be need of some form of record. If any parts are needed from stock, requisition blanks will be required.

Finally a report is turned in on the whole repair. Added to this may be the

shop foreman's report on all jobs as separate from his own record.

The last department covers the relation of the office to the customer. Suppose the owner calls up on the telephone and asks for the car. There must be a record of when the call was received, when the car left, the time of the boy in charge and incidental expenses connected with the delivery, such as telephone, carfare, etc. All the relations between the customer and the office and the expenses connected must be done in writing.

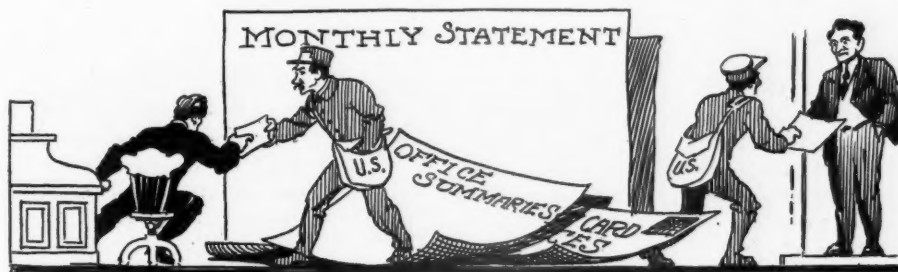
When a repair is needed, such as the new tire formerly mentioned, the owner must be notified either by letter or on a blank as to what is necessary. At this point the tire card of branch three may enter into this relation as showing the customer satisfactory or unsatisfactory service of the former tire as a guide to future purchase.

The Monthly Statement

The last and, of course, the important relation from the garage owner's standpoint is the monthly statement. This should preferably be on a set form giving in columns the separate items before giving a total.

Any system designed to cover thoroughly each department mentioned will do the work of a garage, but in formulating such a system it is well to reduce things to their simplest forms. Thus, in some plants where there is much battery work separate from cars it would be a mistake to include a car-washing report and car-inspection statement on the battery work. In other garages where no battery work is done it were useless to include battery figures on the report. Each card must be suited to its own work as set out by the garage in question and planned to get the greatest result with the least confusion and labor. What would be an ideal set of forms for one garage might be useless for a firm next door.

In formulating a system or planning forms for garage use a knowledge of what others are doing is of great importance so that a study of existing blanks as used by garages all over the United States will be of especial value. These will be taken up in the order of the four branches just mentioned. In some cases it will be noted



RELATION OF OFFICE TO CUSTOMER

FIG. 3—TAGS COVERING RELATION OF CAR TO GARAGE

which go into the shop with the car. The tire card is shown at Fig. 4, including a time card column which connects this card with the time sent to the office finally in the next division of reports.

The paint order is on a similar card and lists the following items: Paint No. 1, paint No. 2, paint No. 3, color of body, color of panel, color of chassis, body stripping, chassis stripping, monogram, miscellaneous, paint used, total. The vertical columns at the right list only time and amount.

Fig. 3 also shows tags used for other repair departments, the smaller one being a battery repair tag used by the Tiffany garage of Boston. A battery repair order used by the Baker garage is shown in Fig. 6 explains itself.

Shop to Office Relations

By far the largest number of forms as a rule appear in the shop to office relation. While their number is many the classes are easily noted. There are forms dealing with the storage, washing and polishing of cars, the daily or other inspections, both mechanical and battery, repair reports to the office, etc., etc.

Some firms use a daily blank which keeps record of all these things on one slip, excepting larger repairs, with details of the battery work on the same card, as shown by the Baker Vehicle Co.'s daily report in Fig. 7. This contains details of minor work done with the charging record for every hour and a space at the bottom filled out for the periodical battery inspection by cells.

The C. U. Williams & Son Co., Bloomington, Ill., uses a very ingenious blank shown in Fig. 8, whereon are shown the readings of the dial direct before and after charging. The report gives no details of the charging but merely aims to show the amount of current that is supplied. Most garages have a monthly battery

inspection. For this a special blank is furnished in many cases, the back of the daily report used by the Neumann-Lane Co. of Detroit being shown in Fig. 9. The front of the card contains the usual daily data for readings on charges for every day of the month, showing specific gravity, volts, time, temperature, with the odometer reading, miles, and whether the car was washed in the last columns.

The reverse of the card is for the inspection figures as shown, and worthy of note is the report on the height of sediment in the cells.

This blank gives the time, temperature, voltage, gravity number, 1, 2, 3 and 4, and a space for remarks. In the bottom list the final readings are given for each cell from 1 to 40. This is printed on a card 8 by 9 inches in size.

Besides the battery inspections there are the mechanical inspections to be gone through with and some firms have the final shop report of both on the same card. One of these is shown in Fig. 10, filled out to show how it is used. This blank is used by the Woods Electric Vehicle Co., St. Louis, Mo., and explains itself throughout.

In keeping track of garaging operations and

storage the Fairchild Auto Co., of New Orleans, uses two small cards $3\frac{1}{2}$ by $5\frac{1}{2}$ inches, one marked "cars stored but not washed" and the other "cars washed and polished," signed by the superintendent and washer respectively, as reports to the office of work done.

FIG. 4—TIRE REPAIR ORDER CARD USED BY BAKER COMPANY

The Electric Truck Co., of Detroit, uses a daily driver's report in keeping track of the condition of vehicles which come into the shop at night. Some similar form is in use by nearly every garage and merely gives the night foreman a line on what each car needs to have done to it before the next day.

Keeping Track of Repairs

Most shops turn in a daily report on the number of cars in process of repair and their condition, this blank to be signed by the night foreman. From all these smaller shop records the final summaries are made up from which the billing is done in the office and part of these might come into the class of the office-owner relation.

Fig. 11 is of this nature, and partly taking in the scope of the daily log of out and in cars except that there is

the car number, date, odometer reading, hours in shop, repairs, condition of car, and signature of driver. This is merely a mechanical report to guide the night foreman as to the work, if any, to be done on the car that night.

The battery inspection slip covers each separate cell of the car with the voltage and specific gravity reading for each cell. This is listed in two columns on a slip 4½ by 9 inches in size. At the bottom follows: The charge rate, rate during overcharge, hours overcharged, water added, and the signature of the man taking the readings.

From these inspections a weekly battery report is turned in covering each day of the period giving the time in garage, time on charging, ampere hours discharged, rate at start, volts end, start rate, reduced to finished rate, finish rate, volts at finish, time off charge, odometer reading, miles for day, wattmeter readings at start and finish, and kilowatt input; in columns consecutive on the top half of a 9 by 9½ sheet, while the lower half lists in columns for each day the time, and volts during daily charge and in a small right hand space the time, volts, specific gravity and temperature during any period of overcharge with the separate date.

The final sheet has just been explained and shown in Fig. 12.

A glance at this final sheet will give all the data necessary to judge the performance of the machine while greater details are had on the other slips.

The last two columns give the total cost and the cost per mile.

Fig. 12 forms are used for the records in this garage for electric vehicles alone. Other similar forms used in the gasoline line are changed to fit the different type of vehicle.

Bookkeeping System

A system as complete as this involves bookkeeping but more than pays for itself in the amounts saved through a greater knowledge of every phase of the business. This firm undoubtedly has had experiences in the past which have brought up the need for each form used so far as its own particular business goes and it would seem that the larger and older the business the more system would be required.

The Baker Motor Vehicle Co., of Cleveland, O., has a very complete set of service blanks, no fewer than twenty-seven having been sent in response to the letter, as follows:

- | | Inches |
|---|---|
| 1—Garage log | 16 by 24 |
| 2—Repair department daily delivery sheet. | 16 by 18 ⁷ / ₈ |
| 3—Inspection report, repair department | 5 by 8 ¹ / ₂ |
| 4—Car report sheet | 6 by 12 |
| 5—Battery record for 42 cells. | 8 ³ / ₈ by 11 ³ / ₄ |
| 6—Daily report card, car and batteries | 5 by 8 |
| 7—*Credit memo, pink. | 9 ¹ / ₄ by 13 ¹ / ₄ |
| 8—*Statement blank, white. | 9 ¹ / ₄ by 13 ¹ / ₄ |
| 9—*Invoice sheet, white. | 9 ¹ / ₄ by 13 ¹ / ₄ |
| 10—Storage tag in triplicate, white, pink and card. | 4 by 6 |
| 11—†Customer's monthly record card | 5 by 10 ¹ / ₂ |
| 12—Garage car record, pink card. | 5 by 8 |
- * Same general size and arrangement
† This card is kept in car

Besides this were some fifteen miscel-

CHARGING TICKET

C. U. Williams & Son Co.

GARAGE


Date _____


Owner's Name _____


Car _____ Miles _____


Time on _____ o'clock.

Reading












_____ **Floorman**


Time off _____ o'clock.

Reading









_____ **Floorman**

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PATENTED BY C. U. WILLIAMS & SON CO. CHICAGO, ILL.

FIG. 7—BATTERY BLANK, SHOWING
DIRECT DIAL READINGS

laneous forms of lesser import from the shipping, sales and purchasing departments. Some of these forms are of especial interest.

The repair department inspection report gives one the idea that repair work in this garage must be especially well handled. The parts listed to be checked are: Motor and reduction, controller, front axle—tie rod and spindle—front wheels, rear axle, rear wheels, brakes, transmission, alignment, lamps, wiring, hoods, doors, windows, distance rods, springs, shackles, steering parts, trimming, body, fenders, paint, battery, floor, general." This slip is headed, of course, by the inspector's name and the car description with owner.

Somewhat similar report is given from the garage on the car report blank, but more definite. Here are listed: "Slip covers, lap robe, seat cushions, cushion blocks, carpet, curtains, side curtains, windows, window fasteners, rain apron, windshield, storm front, child's seat, toilet case, watch, mirror, note book, flower vase, door lock, keys, pull to handle,

lever lock to handle, heel board, seat board, head lamp, side lamp, rear lamp, dome lamp, bulbs, meter, meter light shield, meter base, odometer, license number, hub caps, fenders, hoods, hood keys, starting plug, charging plug, fuses, switches, tool box, spanner wrench, hub cap wrench, monkey wrench, Schrader wrench, battery, tires, extra tubes, Weed chain, tire repair outfit, patches, pump, screwdriver, pliers, jack, battery bridges, battery hooks, extra and remarks."

The daily report on batteries is shown in one of the illustrations, Fig. 7, and is very complete.

Customer's Monthly Record

An unusual card is the customer's monthly record, already mentioned, which is kept in the car. On it are listed daily the date, odometer reading, trip, filled, tested, charged and remarks, each in separate vertical column.

Rather than to follow out further the systems of various concerns in their entirety one would accomplish more by taking the forms for the same service from various concerns and comparing them.

Thus in battery report forms, both for inspection and charging, there are many different ways of approaching the same problem. The form shown elsewhere included the charging report in the night garage man's report on the same sheet, the Baker company of Cleveland uses the card D shown separate, including night work as well. The Neumann-Lane company of Detroit uses a separate slip for battery reports on which is included as noted a record of the height of sediment in the cell and the distance it had run. The ingenious battery card of the C. U. Williams Co. of Bloomington, Ill., on which the readings of the meter are shown direct as in the illustration, Fig. 8, is another way. Smith Brothers of Los Angeles use a daily charging card in duplicate containing the battery record, and also that of night work, such as washing, etc.

The record blank of the Union Light and Power Co. of St. Louis has on the reverse side a separate specific gravity column and report, noting not only this

[illegible]

FIG. 8—BATTERY INSPECTION REPORT USED BY NEUMANN-LAUB CO., DETROIT

WOODS ELECTRIC VEHICLE CO.
BI-MONTHLY INSPECTION
Date 6-5-12

Owner Jones
Car Woods Odometer _____

Battery: Spec. Grav. of 6 Cells
1 1275 2 1280 3 1290 4 1280 5 1280 6 1280

Steering Gear Loose - OK
Wheel Alignment OK
Tires OK
Foot Brake OK
Hand Brake Lightened OK
Controller Cleaned
Motor OK. Cleaned
Meter OK
Lamps OK
Bell OK
Chains OK - Oiled
Fenders Bent
Body Bent good
Wiring OK

Remarks: _____

Foreman must O. K. Report.
Inspector # 3 Foreman RWL
Time: 2 1/2 hrs 14:00

FIG. 9—WOODS' BI-MONTHLY INSPECTION CARD

but voltage for each cell. Being a charging concern, its system of keeping check on all vehicles charging at its stations is most complete.

The Tiffany electric garage of Boston and the Fairchild Auto Co. of New Orleans have detachable checks which are issued as a receipt when batteries are left for charging.

Loose-Leaf Methods

Differing from the garage reports and blanks is the list of forms used by Steinway & Sons, piano makers of New York. This firm keeps a daily motor truck record in a loose leaf book 13½ by 17 inches. This includes the following columns: Date, route, odometer out and in, total miles, weather, roads, repairs, tires, cost, cost per mile, remarks. At the top is placed the truck number and the date.

Added to this is a trucking report, not-

ing: Name, time, rate, amount, dinner, ferry, sundries, total, motor vehicle, horse vehicle. A third blank deals with cartage charges. This firm does not operate its own garage, so that it has no battery forms or the like.

Commenting on the forms submitted, the Woods electric garage of Philadelphia remarks: "We are much gratified by the results obtained by our garage system, especially in the life obtained from storage batteries, the majority of our pleasure car customers running from 2 to 3 years on standard thickness of plates and obtaining from 12,000 to 20,000 miles on a set of plates. We might mention that we use uniformed boys for delivering or calling for cars. The boys also are available for shopping or opera work at 25 cents an hour. The same system prevails on commercial vehicles and our system of inspection and careful battery attention has produced wonderful results in popularizing the electric vehicle in Philadelphia."

The organization and development of their system was due to Leonard H. Worne, now in charge of the Woods garage at Evanston, Ill.

Checking In and Out

The Continental Gas, Electric Light and Power Co. of Baltimore says: "Forms for checking the vehicles in and out of the garage are filled out each day by the driver of each vehicle before he leaves the garage and after he returns to it. The battery-charging report is kept by the switchboard operator, who takes hourly readings of the voltage and amperage of all the cars on charge and the specific gravity of the electrolyte of each battery after it is fully charged.

"The daily repair and charging instruction sheet is made out each day by the inspector, who notes all needed repairs when the vehicles come into the garage. A charging instruction sheet is furnished to take care of any change in the charging rate brought about by changing the batteries in any car."

"Battery work and other repair work that may be done in our garage," says Emerson & Orme of Washington, D. C., "is charged for by the hour through the mechanic's time slips in the usual way. On the car record sheet the space under 'remarks' is used for noting down any complaints that may be made by the owners of the cars or for anything needing attention before the car goes out again."

Smith Brothers of Los Angeles use a duplicate invoice covering the charging of electrics, a yellow one being retained while a pink one goes to the customer. "These invoices," they report, "are kept by the foreman of our electric department and the original readings are placed upon the same. In this way you can realize that the customer knows just what is going into the car and how much time it takes. We have found it to be a very satisfactory way of keeping in touch with the charging in our electric department."

The Krebs-Gottshall Co. of Denver send its overhauling record into the shop with each car, the work being done and checked up on this report, which comes back to the manager for examination and filing.

The charging cards of this firm show the readings taken at the start of the charge and for every hour after, also when the car comes off charge, number of hours on charge, average ampere hours, line voltage and net kilowatt hours. These cards are turned in each morning by the night foreman. They are then checked up, entered on the semi-monthly record and filed away. The semi-monthly record is just what it pretends to be and records all the important items of the car's service and cost for the period.

The chaser card mentioned before, and illustrated elsewhere, is made out by the telephone operator at the time the order for the car is received over the wire. It is stamped at once with an electric time stamp. The car is then brought to the front of the garage, checked out and the driver stamps out and signs the card on leaving the garage, then stamps again on his return. The same procedure is gone through with when the car is sent in at night, and a report of the condition of the car is entered at the top.

Trucks Overhauled Weekly

Semi-monthly records are kept filed so that they may be referred to at any time. Motor trucks get a weekly overhaul in this garage, pleasure electrics a semi-monthly overhaul. This is included free in the regular garage rates.

The Fairchild Auto Co. of New Orleans says: "We have a card for cars that are washed and polished, stating the license, make, owner, date and washer, and also a card, 'cars stored but not washed,' on which the same information is put. These cards are put out one at 6 a. m. and

Night Garage Record June 1 1912														
	NAME	CALLED UP	OUT	IN	BY	TAKEN BY	Odometer	Chg. Lin	On Chg.	Volt	Amps.	In Grand	Final Grand	REMARKS
Miller	Jones	8:30	8:35	8:50	# 6	# 1	1722	3	10	81	22	1200	1280	Fender Bent
Hanson														
Howard														
Young														
Bent														
Jones														
Walker														
Walker														

FIG. 10—NIGHT GARAGE RECORD BLANK USED BY WOODS ELECTRIC CO., ST. LOUIS

YEAR		SUMMARY										ELECTRIC AUTOMOBILE No.						
TYPE		CAPACITY					KIND OF SERVICE					DEPT.						
		EFFICIENCY DATA					MAINTENANCE AND OPERATION COSTS					FIXED CHARGES						
MONTH	Miles Traveled	K. W. Input	Miles per K. W. Hrs.	Days In Use	Days In Shop	Batteries	Tires	Power For K. W. H.	Repairs and Sundries	Total	Total Per Mile	Driver	Foreman and Other Team	General Garage Expenses	Insurance, Taxes and Depreciation	Total	TOTAL	TOTAL COST PER MILE
January																		
February																		
March																		
April																		
May																		
June																		
July																		
August																		
September																		
October																		
November																		
December																		
TOTALS																		
Remarks:																		

the other early in the morning, so that in this way a very complete track is kept of cars that are stored, washed and polished. We have also a book in which we put the customers who store here by the month. Any repairs to batteries or electric cars we put in a book kept for that purpose. We have a white card and a pink card, the white one for charging supplies, etc., to the customer and getting his receipt for same, and the pink one to credit him with goods returned. Red, blue and yellow tags, marked recharge, are used for our gas tank trade. On these we put the name of the purchaser, the date, the number of the full tank and the number of the returned empty."

Care of Electric Vehicle Storage Batteries

Commonwealth Edison Co., of Chicago Believes in Educating Its Customers and Issues Directions for Looking After Power Plants of Commercial Trucks—System Important Part

Compliments of
COMMONWEALTH EDISON COMPANY
120 West Adams Street Telephone Randolph 1280 Chicago, Ill.

Electric Vehicle Battery Record of _____

Address _____

Make of Vehicle _____ Type of Battery _____ No. of Cells _____

DATE	START		FINISH		WATT METER READING	WATT METER READING	KILO-WATT HOURS	GRAVITY		AMP-HOUR METER		MILES RUN	REMARKS
	TIME	AMPS	TIME	AMPS				START	FINISH	DISCH.	CHARGE		
1													
2													
3													

FIG. 1—CHARGING CARD AND BATTERY RECORD FURNISHED CHICAGO CUSTOMERS

AS the electric storage battery is a vital part of the electric vehicle so the care of the battery is a vital branch of electric vehicle operation.

Where a firm is operating a large fleet of vehicles it is usual for it to run its own garage, having a man in its own employ to attend to battery work. This one is supposed to be trained for his particular job.

The small user of the electric vehicle has a different problem. Of course he can have his machine attended to at a garage under contract, but even then it is important that he know something about battery care and management so that in the case of trouble he will be able to gauge reasons and the better place the blame for failures on the proper shoulders.

That battery care is important is shown in the case of a certain department store which had an unfortunate experience with electricians on its first try out. This firm now prefers horses. The reason is something as follows:

Uses Wrong System

When other city stores began the use of electric vehicles this firm got in line and purchased a machine for tryout. The truck was put on the road on old horse routes and was attended to in the garage of the firm. The man having it in charge was unacquainted with electric battery operation and as a result the mileage obtained was not sufficient and could not be depended upon; the batteries depreciated

to an alarming extent and the vehicle in general proved a miserable failure. It was the vehicle that gave out and hence it was the vehicle that was blamed. That the failure was due to ignorant handling was not considered.

The argument of the agent that the electric is foolproof does not hold in the garage as it does on the road, for ignorance in the shop is fatal to an electric vehicle. Ignorance is becoming less dangerous, however, with each succeeding improvement in the storage battery.

Commonsense Methods

Other firms in the same locality using the same make of truck made failures of their machines at the start. They charged their batteries too fast and injured the plates, or overcharged and burned them. They charged in a cold room and then wondered why they couldn't get the mileage; they used the wrong meters and the wrong reading systems in charging so that they did not know what was going into the battery. The result was short battery life. Again the cost of current was higher in those days and the central station took small pains in instructing users of current as to battery care.

The one firm, disgusted with the experience, quit trying and went back to the horse. The other firms took the lessons they had learned, built upon them and finally became expert in the handling of batteries and in their charging so that at last with the one or two cars running suc-

cess was attained and the delivery put on a paying basis.

This has happened within the last year largely, so that now, knowing the possibilities and also the limitations of the battery the firms know just what to do and are planning to do it. The firm that gave up is still wallowing in the mire of horse inefficiency.

Valuable Instructions

To obtain success with motor trucks or any electric vehicles battery care is necessary. To obtain the care the owner should know some of the first rules of the work. Realizing this, the Commonwealth Edison Co. of Chicago has gotten out a set of instructions which contains the main rules and directions for taking care of batteries of the lead type. Some of the directions given follow:

1—Before starting to charge, ascertain from the vehicle or battery manufacturers the capacity of the battery in kilowatt hours; that is, the number of kilowatt hours of electrical energy that must be put into the battery in order to obtain from the vehicle its rated mileage on one charge.

2—Keep an account of the kilowatt hours used for each charge by reading the kilowatt hour meter installed in each case by the Commonwealth Edison Co.

3—Estimate, roughly at least, if not exactly, the amount of charge already in the battery by testing the strength of the solution in the battery.

4—When the battery is only partially discharged it requires only a partial charge. Charging a battery that is already full is not only a waste of current, but is injurious to the battery.

5—Do not charge too fast as it shortens the life of the battery; that is, do not as a rule exceed the charging rate recommended by the battery manufacturer for the particular size of battery that is in the vehicle.

6—If a battery is discharged until it is practically empty, it should be charged again, at least partially, without much delay. If allowed to stand for any length of time, more than the usual number of kilowatt hours of current will be required to get it back to a fully charged condition.

7—When a battery is being charged, the voltage of the battery rises and the gravity of strength of the acid in the battery increases. When the battery is being discharged the voltage decreases and the acid becomes weaker.

8—The increase of acid strength, or specific gravity, is directly proportional to the number of kilowatt hours of current put into the battery, the specific gravity curve being practically a straight line. The increase of voltage on the other hand is not proportional to the number of kilowatt hours put into the battery, but increases rapidly at the commencement and also towards the end of the charge, but increases at a slower rate during the middle of the charging. The voltage also varies with the strength in amperes of the charging current.

9—Either a voltmeter or hydrometer may be used to determine when a battery is fully charged, but preferably both methods should be employed, one as a check on the other.

10—Automatic devices for shutting off the current when the battery is supposed to be fully charged may sometimes be used to advantage, but care should be taken to have them in good working order and adjusted correctly. They can not be relied upon to operate when anything happens to be wrong with any of the cells in the battery or where there is considerable variation in the line voltage.

11—The Commonwealth Edison Co. furnishes two kinds of current—direct and alternating. If a battery is to be charged in a district where direct current is supplied, resistance coils are used to adapt the voltage of the line to the voltage of the battery. If the charging is done in an alternating current district, a rectifier or motor generator must be installed to convert the alternating current into direct current of the desired voltage.

12—A certain loss of current always takes place in the charging and regulating apparatus, and this loss in kilowatt hours should be added to the kilowatt-hour capacity of the battery when estimating the number of kilowatt hours required to charge the battery.

13—When charging is done by means of a rectifier, the alternating current switch should



be opened when through charging, as a certain amount of electricity is used to keep the rectifier coils excited.

14—The mileage that can be made with a certain number of kilowatt hours of charge can be found by observation and should not vary as long as the conditions under which the vehicle is operated remain unchanged.

15—If the mileage obtainable from a given number of kilowatt hours begins to fall off, the cause of the falling off should be looked for without delay and the vehicle put in good running order.

Following these rules are some general remarks relating to the importance of battery care:

The amount of care that a properly constructed battery needs is so small that batteries may sometimes be operated for months at a time and apparently in a satisfactory manner without receiving any intelligent attention whatsoever. Unfortunately for the reputation of electric vehicles this fact has in too many cases been responsible for the impression that a storage battery will work equally well whether any care is taken of it or not. Such, however, is not the case.

To insure continued good service it is absolutely necessary that a record be kept of the amount of current that is put into the battery and that the strength of the acid in the individual cells be tested every few weeks in order to know if all the cells are working uniformly. If for any reason one or more of the cells are not keeping in step with the rest of the battery in regard to rise and fall of voltage and specific gravity, the effect may not be immediately noticeable in the operation of the vehicle but the voltmeter reading can no longer be relied upon to indicate when the battery is fully charged, and, as a consequence, the charging is likely to be done in a way that is wasteful of current and injurious to the battery. A defective cell should be taken out and put in good condition without delay.

Charging Batteries

Although it is essential that the charging should be done in a careful and intelligent manner, in order to obtain good service, no hard and fast rules for charging can be laid down that will apply equally well under all conditions. The reason for this is that a lead battery will absorb current at a greater rate at the commencement of the charge than it will towards the end of the charge, and consequently the rate that will charge the battery in the shortest time without injury to the plates will taper gradually from the commencement to the end of the charge.

In some cases the number of cells in a battery may be so proportioned to the voltage of the charging circuit that the increase of voltage of the battery while charging will reduce the current flowing into the battery in such a way that no adjustment of the charging apparatus is needed during the whole time the battery is charging. These conditions, however, are not found in all cases, and as it is generally difficult in practice to taper off the current in the way that would theoretically give the best results, it is usual to recommend that the charging be started at a comparatively high rate and reduced towards the end of the charge to about one-half of that rate.

The starting and finishing rates for any particular size of battery can be obtained from the manufacturer of the battery that is used. The rates recommended by different battery makers are practically the same for cells of the same weight.

The equipment of every electric vehicle should include the following:

A voltmeter to indicate when the battery is fully charged; an ampere meter to show the rate at which current is going into, or out, of the battery; a hydrometer to test the strength of the acid in the battery, and a mileage indicator.

When a battery is fully charged and still charging at the finishing rate, the voltage of each cell should be a little over 2.6 volts, which for a battery of forty cells would amount to about 104 volts.

A special hydrometer is made for testing the strength of storage battery acid. This instrument has a scale reading from 1100 to 1300 degrees of specific gravity. When a battery is fully charged experience has shown that the best results are obtained when the strength of the acid is about 1280 specific gravity. When a battery is practically empty the gravity usually reads about 1180. The range, however, will vary somewhat with the type of battery used. The actual range for any particular battery may be found by observation, after which the state of charge of the battery will be indicated by the specific gravity of the acid.

Although it is not so convenient as a rule to take gravity readings as to observe the voltmeter readings, the indications of the hydrometer are more reliable than those of the voltmeter, as they are independent of the current that is passing through the battery. The accuracy also of the voltmeter on account of its more delicate construction is somewhat liable to be affected by the jolting of the vehicle, while the readings of the hydrometer



are not subject to errors of this source.

When a lead battery is in operation a certain amount of the material of the plates is thrown off by the action of the current and drops to the bottom of the jar. To prevent this sediment from interfering with the action of the battery, the plates are not allowed to rest on the bottom of the jars, but are supported by strips which keep them an inch or more above the bottom. After the battery has been in operation for about 6 months the accumulation of sediment will probably be nearly up to the bottom of the plates. If this is the case, the battery should be taken apart and the sediment removed by an experienced person, after which the battery can be operated until it is again in need of cleaning.

Particular care should be taken to remove the sediment before it has reached the plates instead of waiting until the operation of the vehicle has shown that there is something wrong with the battery. Every few months the plates should be taken out of one of the cells to see whether or not the battery needs cleaning.

Briefly then, the care of a storage battery consists of putting the right number of kilowatt hours of electricity into it at the proper rate; testing the individual cells at regular intervals to detect minor accidents; removing the sediment before it reaches the plates, and adding a little distilled water occasionally to replace evaporation.

As an aid to charging, records the Commonwealth Edison Co. furnishes blank cards as shown in Fig. 1, and which customers are recommended to use in keeping check on their own equipment and its satisfactory work.

Differing from the directions just given are those for the care of Edison cells. These cells require frequent flushing with distilled water and must be kept clean but otherwise require little attention. They are guaranteed for a life of from 3 to 4 years and many cells seen in use in Chicago which have lived the average life of a lead cell are seemingly as good as new and still giving as great an output as at the start.

Should Test Specific Gravity

It is claimed that these cells cannot be charged too fast, or abused in any way in charging or overcharging. All that is necessary is to test the specific gravity before starting the charge to see how much current is required to fill the battery and then plug in. At the end of the discharge period the plug is drawn. If it is not drawn at the proper time the bat-

teries suffer no hurt from the overcharge.

These batteries, too, can come in entirely empty and on being charged again take up full load immediately. Most of the lead cells take time to recuperate after such treatment.

Boosting an Edison cell between charges does it no harm. On the other hand the Edison cell is higher priced than the lead type, a little slower and possibly uses a little more current. Its advantages, however, are many and its use is rapidly increasing.

Eliminating a Trouble

The Boston Store in Chicago uses Edison batteries exclusively. At the start there was some trouble with the cells through dirt gathering on the tops of the batteries, excelsior and water leaking down from the car floor above. The solution on charge would boil up and the result would be several leaky cells. When the trouble was located, however, a rubber sheet was placed over the battery between it and the floor of the car and in the drawing and since then—over a year—there has been not the slightest trouble. The specific gravity of the liquid is kept about 1.184, and the cells are flushed twice a week with distilled water. There is no sediment to watch, according to the barn man of this firm.

For the private owner of a single electric delivery vehicle it is generally an advantage to let out the work of battery handling and charging rather than to experiment on one's own car. When more cars are added it is a mere business proposition of figuring to determine by local conditions and costs when it will pay to start a plant to take care of one's own batteries, hiring a man especially for the work. When enough cars are in use to keep a man busy all the time, one generally can plan on keeping the machines under his own care, provided enough current is used by the vehicles to keep current cost down to a proper level.

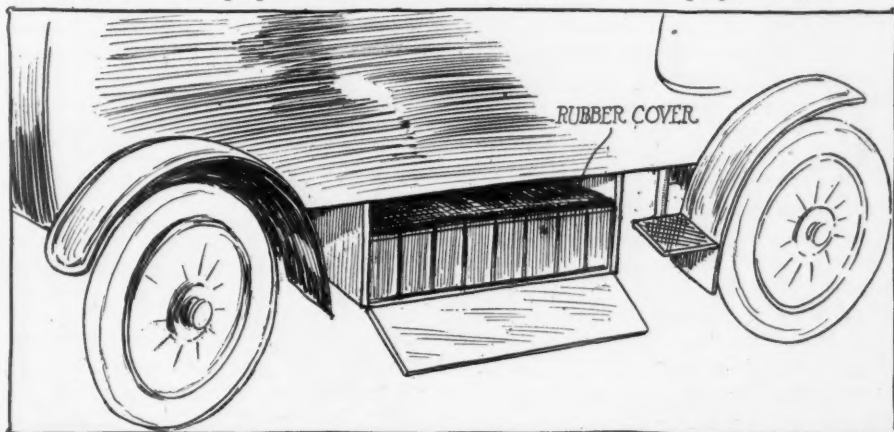


FIG. 2—RUBBER BATTERY COVER USED FOR EDISON CELLS BY BOSTON STORE, CHI-

Figuring the Cost of Truck Operation

So Many Items Enter Into Calculations that Every Case Becomes a Separate Problem—How Some Concerns Secure Desired Data—Chart Shows Schedule of Prices for Charging Batteries—Good Average Obtained

IT is daily becoming more evident that to name a figure as the cost of running any certain motor truck is misleading. This is especially true of electrics.

We often hear it said that it costs \$12 a day inclusive to run a 3½-ton truck. This may be true in most cases or some cases, but in others it is entirely misleading. Because it costs A \$12 a day to run a truck, it is no sign that in B's work it cannot be run for \$8, or that with C it will cost \$20 with the same vehicle. All depends on the conditions under which the machine works, the number of men carried, the kind of roads, the waits, etc.

Again, the man who ran the machine on \$8 a day might be losing money on the truck, while the man who had to pay \$14, for instance, might be saving \$20 a day on the truck over former horse systems.

With the gasoline motor truck conditions are not so broad, for the cost per mile of gas, oil, tires, etc., will not vary so greatly. With all trucks so many items enter into costs that every case is a separate problem.

In the first place the price of current varies considerably with the location, some cities having better facilities than others. Some central station firms have been quick to see the value of the motor truck and its possibilities for increasing the current used from their plant and have put special men to handle the work. These have met the electric truck users more than half way and have showed them how to operate to best advantage, knowing that satisfied users of electric vehicles would bring more current consumers into the field by increasing the number of electric vehicle installations.

Studying the Situation

Electric truck users in these towns have gone to work with their new delivery systems with a good start and under knowing guidance, thus avoiding many of the costly pitfalls which are met with by the first users in towns where there are no facilities for instruction.

Again there are firms running factories or plants of one kind and another which have facilities for generating their own current and doing their own charging. It stands to reason that some of these can save money by this arrangement, others will lose. The writer has in mind a certain firm operating a large plant which for purposes of illustration we will call a laundry. Here they have in operation a large number of machines operated by a power plant in the rear of the main buildings and consuming about 10 tons of coal a day. The plant runs day and night

with work a trifle heavier at night. Some forty trucks, mostly electric, are used in the delivery of the goods and all of these are handled by the firm.

These cars are charged at night and figures show that the difference in coal consumed in the boiler room during the heavier night hours, including the extra work in the plant itself, is only 2 tons above the day figure. There is no addition to the number of employees over the day force on account of the motor trucks except the man in charge of the battery charging. Figuring the cost of the coal at \$8 for the two extra tons, the current for the cars is costing but \$8 a day, or for forty cars 20 cents per car per day.

It is admitted that this figure is unusual, for 50 cents per day is nearer the average figure for ordinary service, yet this firm, as it figures it, is charging the cars at 20 cents per day's run.

Figuring the Upkeep

Other costs mentioned by the superintendent of the plant are interesting as figures for this one case and some would apply approximately in any case. Upkeep costs for each vehicle come to \$383 per year. Batteries costing \$225 are lasting the firm 1 year on the average. One set of batteries lasted 16 months, while others last only 8 months, but the figure 12 is average.

The life of the battery was said to depend on the thoroughness of the drying out of what they called the mud part of the battery in the manufacture. Added to this was a certain amount of careless handling in charging which burnt some of the cells when comparatively new, through overcharging. Other batteries were deteriorated by misuse on the road. All of this limited the life average to 1 year, costing about \$19 per month.

Tires on these 1-ton cars run 10 months average at a cost of about \$60 per set or \$72 per year. In keeping track of these the number of each tire is listed when put on as well as the wheel number. Every wheel in the shop has a number. A strict record is kept of every tire and wheel in the garage.

This firm plans on painting each car every 2 years, touching up and varnishing being done every year. Averaging the painting and touching-up jobs, the paint

cost comes to \$43 per year average. Judging by the looks of some of the cars used by this firm, the painting is done none too often.

The amount for daily repairs varies with the driver and somewhat with the battery weight of the vehicle, but figures at close to \$18 per year, while replacements come to \$25 per year. All of these items add up to \$383. Sixty dollars may be put to this for current per year, making \$443 for running costs outside of driver.

As to driver's wages this cannot be determined by this firm, as each driver is a salesman or solicitor and is paid by a percentage of the business he does. If he makes more stops and handles more business than his neighbor driver he earns more pay. Thus the driver cost is not fixed in this case, but is figured in as selling cost on the goods handled by the firm. Any mileage a driver makes with a motor truck or added work he does over horse equipment—which this firm operates at about the same cost—is so much velvet—both for the firm and the driver. It is this extra that makes the motor truck a paying proposition.

For instance, there was a certain route on which originally five horses were used—one extra, for emergencies. Two wagons covered the route. After making a trip and finding that the roads were in good shape in the districts an electric truck was put to work. It has since done the work of the five horses and two wagons every day with more reliability than the horses and quicker, covering more territory.

Foreman Makes Daily Report

In figuring costs on vehicles the foreman of the shop turns in a report each day on a blank as follows:

Number of	Date.....
car	
101. All right	
102. Bearing on jackshaft tightened	
201. All right	
	Foreman.
O. K.	Manager.

After the manager's O. K. is affixed the sheet is copied into the books in its relation to each car.

The figures given would bring the cost of the car's operation in this plant to about \$4.15 per day without driver or fixed charges, such as interest, insurance, etc.

In operating electrics all of course centers about the battery. These are the expensive parts of a truck and need the most care. The cost of operation of a vehicle will depend largely upon the way





the batteries are handled and what brains are put into the handling of the electrical end of the garage.

The charging of batteries is an important branch of truck maintenance as affecting repair and upkeep costs as aside from the current consumption itself.

In charging the storage batteries there are two kinds of current to be purchased, the alternating and direct. This current can be put in at any time if in small quantities, but where many vehicles are used the machines should be charged off peak or at times other than when the central station is working to its fullest capacity.

Securing the Current

The greatest loads on central stations come when the most lights are used, such as between 6 and 11 p. m., and plants must be of a size to handle this maximum load without trouble. This being so much greater at these times there is of necessity more equipment in operation during those hours. At other hours much of this must remain idle, so that the central stations can afford to furnish current at the low periods at a less rate than at the peak period, to keep the station busy at off hours.

Again the price per kilowatt depends on the consumption, the small consumer being charged more than twice the amount

per kilowatt that the large consumer pays.

The accompanying chart, with curve, shows the facts of electric vehicle charging with the schedule of prices in force by one of the largest central power stations in America. The column at the left with the figures represents the price per kilowatt, the lower horizontal row of figures the kilowatt-hour consumption per month. Since the price depends on the consumption, these may be resolved into the curves shown.

The shorter curve, starting at a price of 4 cents per kilowatt, is on the all-day schedule. The rate of 4 cents holds for single 1, 2, 3½ and 5-ton vehicles. For two 2-ton vehicles the rate is slightly less and so on down to the point where the two curves cross, where twenty 1-2-ton vehicles are consuming 6,700 kilowatts and have the rate of about 3¼ cents per kilowatt.

When consumption gets to this point it will pay the consumer to switch to the off-peak schedule shown on the other curve, for beyond this the rate drops very quickly on the new curve.

Workings of the Plant

Twenty 1-ton vehicles, for instance, consuming 11,600 kilowatts are charged but 2¼ cents. This figure, by the way, exactly coincides with the current consumption bill of a large department store for a recent month, this firm operating just twenty 1-ton vehicles, showing the approximate accuracy of the curve.

If fifty 1-ton machines were used the



rate would drop to 2½ cents and so on. The lowest figure shown would be 1.7 cents for 100 3-ton machines.

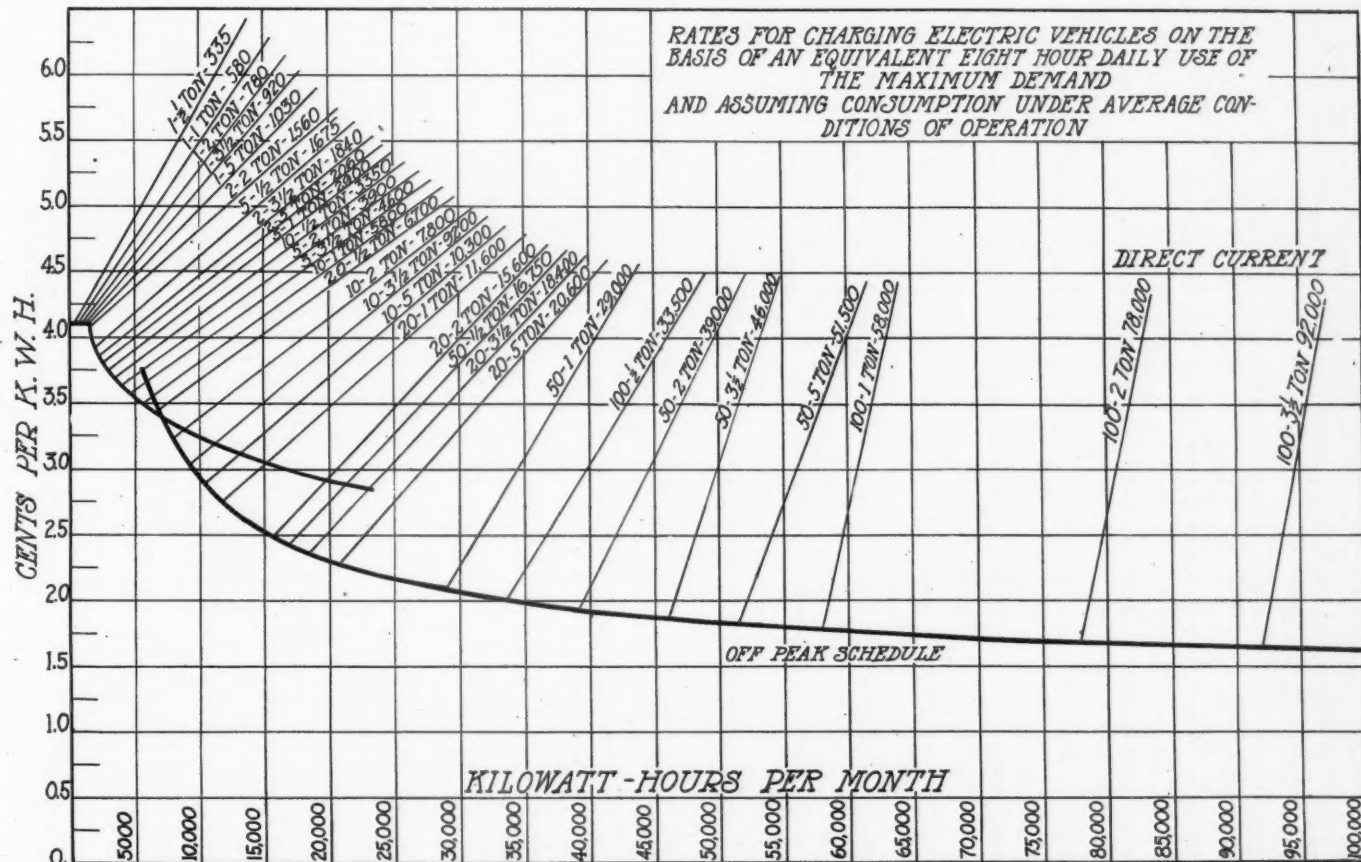
These figures are for direct current and for machines in ordinary conditions of service, but are by no means to be taken as iron-clad.

When alternating current is used the figure will be lower by 10 or 15 per cent, but when one remembers that there is a loss of 20 per cent or more through the motor generator which changes the current to direct for the battery charging it will be seen that it will cost more to charge from the alternating lines.

Discovering a Leak

One user of a 3-ton electric vehicle recently made a complaint as to the cost of current, his bill being \$80 to \$90 per month, whereas others were getting current for their machines for \$6 to \$9. On checking up the firm it was found that the alternating current was being charged by an old type of inefficient belt-drive motor-generator which on test showed a loss of over 50 per cent. This and other pieces of mismanagement caused the extra expense.

Electric vehicle costs are largely dependent on the user and a little study of the vehicle now and then will save many dollars.





NEW YORK OFFICE
239 West 39th Street

MOTOR AGE

Published Weekly by
THE CLASS JOURNAL COMPANY
910 SOUTH MICHIGAN AVENUE CHICAGO

SUBSCRIPTION RATES
United States and Mexico
\$3.00 per Year
Other Countries including
Canada \$5.00

Entered as Second-Class Matter September 19, 1899, at the Postoffice at Chicago, Illinois, under Act of March 3, 1879

The Electric Industry

NO other characteristic of the motor industry for 1912 stands out with greater significance than the progress made in the electric passenger car field, and also in the wider use of electric commercial cars. Heretofore the use of electric passenger vehicles has centered in a dozen cities, some of these being of minor importance, whereas metropolitan centers in the east in particular have not been nearly so great users of these vehicles as their population would indicate. During the past year there has been a very general introduction of the electric passenger vehicles in scores of cities where they hitherto were comparatively unknown or had a very limited following and indications point to a continued increase.

THE credit of this more general use of the electric is due to the makers of these vehicles and also to the central station interests by central station being meant the companies furnishing electric current in these cities.

THE activity of the manufacturer has shown itself in the more general production of closed body types, and also in the introduction of larger bodies, which can most satisfactorily take the place of the gasoline limousine, where the buyer is disposed to favor the use of the electric. In addition to one or two makers listing types, practically all of the others have enlarged their brougham styles and redesigned them so that all of the passengers face forward, giving a body which satisfactorily meets all the requirements of city use. Such a body is practically on a par with what is known as the single-compartment type now gaining in popularity with gasoline adherents and which is proving its worth.

THE electric manufacturer deserves credit in taking up this field of manufacture and developing a department in which it is possible to have the electric passenger vehicle supplement a gasoline equipment. In a dozen cities car owners have found it convenient to equip with a gasoline touring type and an electric closed type, one complementing the other. This is particularly desirable where the owner drives, in that the single-compartment electric type gives an admirable winter and wet-weather vehicle.

IT is commendable that manufacturers of electrics should take a rational view of this department and aim at producing a vehicle excellently adapted for city and town use, instead of trying to produce a high-speed machine for other fields. Electric makers are now uniting in the matter of keeping the speed of the vehicles down—in fact, recommendations have been made to standardize speeds, so that added battery equipment gives increased radius of action to the electric vehicle, rather than dangerously high speeds.

BUT while alert in the selection of fruitful fields for development, the electric maker has also been busy in the mechanical development of his product. Credit must be given to the battery makers for what they have done, and by means of which it is possible to bring the electric to its present mature stature, but the engineer of the vehicle must receive his consideration. He has been working along varied lines, and while nothing radi-

cal appears, the little details show that he is keeping step with the trend of the times. There is a steady adoption of inclosed drive, the propeller shaft being the most popular adaptation of this. At present but two or three exponents of the exposed chain remain. While the double reduction between the armature shaft and the rear wheels is in the majority, there is a slow movement in the direction of a single reduction, but at present it is impossible to state what the final situation will be.

THE electric, which has always been characterized with simple and trouble-proof control, has made advancements along this line, all with the one object of making it well adapted for women, who, in so many cities of the United States, are great users of them.

THE electric commercial vehicle has received steady assistance during the year from the central station people, who have, although slow in coming to a realization of the matter, at last realized the dollar-and-cent value of the motor truck as a consumer of current. These interests have taken up the question with avidity and have done wonders to help the sale of trucks in their localities. One leading eastern concern announces that since it has started an electric vehicle department there has been a 500 per cent increase in current used in charging vehicle batteries; and further states that there has been a 100 per cent increase in current consumption in the past 6 months. Reports from two-dozen other centers show practically the same general increase in the use of electrics.

MUCH of the credit for the present co-operative movement of the electric vehicle interests is due to the aggressive policy of the Electric Vehicle Association of America, which national organization is getting its local sub-organizations working in several of the leading cities. This organization has taken up the varied aspects of the industry; and in addition to promoting general advertising for the benefit of electrics, has lent its assistance to the matter of developing electric garages, reducing the rates of insurance, standardizing charging plugs, adopting standard signs for battery charging stations and, in a word, working along every possible line for the development of the industry, and the attracting of public attention to it, all of which is most commendable.

ONE of the most important works of the Electric Vehicle Association of America is that of education, a work at present in its infancy, but one which is bound to receive more attention as time goes on. This organization realized that the success of an electric commercial vehicle largely depends on the driver, and that to get the most out of a driver he must be educated to a degree. With this object before it the association is at present developing a strong spirit towards drivers' courses of instruction in leading cities. The object of these courses is mainly to give the drivers a requisite knowledge of electricity to make them competent and efficient operators of vehicles. These courses will also include the elements of business, which it is necessary for a driver to understand if he is to adequately fill his position. Education along these lines is what is needed for the drivers.

Boston Man Wins Winton Upkeep Test

CLEVELAND, O., Dec. 28—John L. Dondero, chauffeur for F. M. Hawthaway of Boston, sixth last year, is the winner of the fifth annual upkeep contest promoted by the Winton Motor Car Co., which hangs up \$3,500 in cash prizes for those drivers of Winton sixes who best serve their employers by saving them money in repair bills. Last year Dondero piloted his car 22,932 miles, with no upkeep expense, while this year he totaled 26,987 miles, also with a clean bill of health so far as repairs go. The winner of the 1911 contest was P. W. Mulford, driver for R. R. Reilly, of Cincinnati, whose car turned 27,325 miles, with an upkeep expense of \$1.20.

Three others of last year's prize-winning twenty were recognized this time—Brubaker and Green, of Chicago, and Stokes of Philadelphia. Last year Brubaker was thirteenth with 18,960 miles and no expense; this year he was fifth with 15,729 miles and no repair bill. Green was eighteenth last year with 16,531 miles and a bill of \$10.76; this year he was second with 22,928 miles and no expense. Stokes had 13,853 miles last year and no expense, being nineteenth, and this year he landed eighteenth with 11,126 miles and no expense.

The judges were E. E. Schwarzkopf, of the Automobile Club of America, New York; R. G. Howse, Earl Reeve and John E. Williams, of Chicago; and D. G. Newton, of Cleveland. Their awards were as follows:

First prize, \$1,000, to John L. Dondero, chauffeur for F. M. Hawthaway, Boston, who drove 26,987 miles with no repair expense.

Second prize, \$500, to William J. Green, chauffeur for Dr. Espy L. Smith, Chicago, who drove 22,928 miles with no repair expense.

Third prize, \$250, to Thomas Murren, chauffeur for J. M. Anderson, Medford, Mass., who drove 16,477 miles at a repair expense of 95 cents.

Fourth prize, \$150, to Albert Bedard, chauffeur for Charles B. Maguire, Providence, who drove 18,245.3 miles at a repair expense of \$18.01.

J. L. Dondero Drives 26.987 Miles Without Any Repair Expense

Fifth prize, \$100, to E. P. Brubaker, chauffeur for J. W. Stevens, Chicago, who drove 15,729 miles with no repair expense.

Sixth prize, \$100, to J. Walter Tracy, chauffeur for James C. Biggert, Crafton, Pa., who drove 14,022 miles with no repair expense.

Seventh prize, \$100, to J. F. Folger, chauffeur for J. S. Snyder, San Francisco, who drove 14,474.6 miles at a repair expense of 75 cents.

Eighth prize, \$100, to Frank Schneider, chauffeur for Milton Schnaler, New York, who drove 14,431 miles at a repair expense of \$3.60.



J. L. DONDERO, WINNER OF WINTON UPKEEP CONTEST

Ninth prize, \$100, to Herbert Decker, chauffeur for Mrs. R. Whitehill, Newburgh, N. Y., who drove 12,541.8 miles with no repair expense.

Tenth prize, \$100, to L. V. Wright, chauffeur for Charles F. Lembke, New York, who drove 12,716 miles at a repair expense of 15 cents.

Eleventh prize, \$100, to A. N. Peters, chauffeur for H. G. MacDougall, Brighton, Mass., who drove 13,845.4 miles at a repair expense of 95 cents.

Twelfth prize, \$100, to E. A. Hodge, chauffeur for F. H. Heald, Milford, N. H., who drove 13,441 miles at a repair expense of \$21.22.

Thirteenth prize, \$100, to Harry Batch, chauffeur for Joseph F. Mayhugh, North Brad-N. Y., who drove 11,743.3 miles at a repair expense of \$53.65.

Fourteenth prize, \$100, to S. J. Meneely, chauffeur for Harry Livingston, New York, N. Y., who drove \$11,743.3 miles at a repair expense of \$5.25.

Fifteenth prize, \$100, to John L. Scott, chauffeur for Marcus Bacharach, Philadelphia, who drove 12,271 miles at a repair expense of \$25.35.

Sixteenth prize, \$100, to Joseph H. Gallo, chauffeur for Harry Livingston, New York, who drove 11,307 miles at no repair expense.

Seventeenth prize, \$100, to William Ahrens, chauffeur for R. H. Reid, Brooklyn, who drove 11,150 miles at no repair expense.

Eighteenth prize, \$100, to E. E. Stokes, chauffeur for the Friends' Asylum, Philadelphia, who drove 11,126.3 miles at no repair expense.

Nineteenth prize, \$100, to Clarence Finley, chauffeur for N. D. Frazer, Chicago, who drove 11,119.5 miles at a repair expense of \$1.25.

Twentieth prize, \$100, to William J. Armstrong, chauffeur for H. C. Rummph, Philadelphia, who drove 10,870 miles at a repair expense of 85 cents.

Four chauffeurs who were hot contestants for big money reported total mileage of 88,000 miles, but their records were not accepted because they had permitted their odometers to remain out of order at one time or another.

In the 5 years of this contest, the money winners have divided \$14,500 and have driven more than a million miles. The average repair expense for 5 years is 29.2 cents per 1,000 miles. The first 2 years of the contest the Winton company offered only ten prizes each year, with the cash totaling \$2,500. The contest proved so popular, however, that another \$1,000 was added and the number of possible prize winners increased to twenty. The annual figures follow:

Year	Cars	Total Mileage	Total Repair Expense
1912.....	20	290,759	\$131.98
1911.....	20	394,333.9	20.88
1910.....	10	165,901.9	6.96
1909.....	10	118,503	127.30
1908.....	10	65,687.4	15.13
Totals...	70	1,035,185.2	\$302.25

The idea of the contest—that of saving repair bills through the carefulness of the chauffeur—has appealed to the owners also, many of whom have entered into the spirit of the affair with as much zest as their drivers, permitting the chauffeurs to run up extra mileage when they are not on duty in order to give them a chance to win.

MEETINGS

January 14-16—Motor and Accessory Manufacturers' meetings at New York.
January 14-16—Society of Automobile Engineers' meetings at New York.

SHOWS

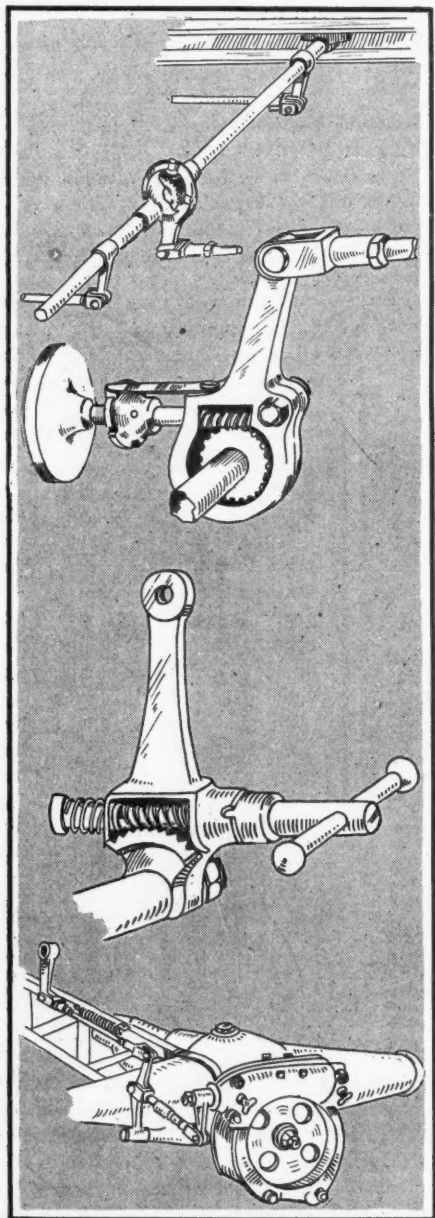
December 7-22—Paris salon.
December 16-21—Seattle, Wash.
January 2-10—Importers' Salon, Hotel Astor, New York.
January 4-11—Cleveland.
January 4-11—Montreal.
January 11-18—New York pleasure car show; Automobile Board of Trade; Madison Square Garden and Grand Central Palace.
January 11-18—Milwaukee, Wis.
January 11-22—Brussels, Belgium.
January 20-25—New York truck show; Automobile Board of Trade; Grand Central Palace and Madison Square Garden.
January 18-25—Philadelphia pleasure car show.
January 21-26—Toledo show.
January 25-February 1—St. Johns, N. B.
January 25-February 1—Providence, R. I.
January 25-February 1—Montreal, Canada.
January 27-February 1—Rochester, N. Y.

Coming Motor Events

January 27-February 1—Ottawa, Ont.
January 27-February 1—Scranton, Pa.
January 27-February 1—Detroit.
January 27-February 1—Buffalo, N. Y.
January 27-February 1—Philadelphia truck show.
February 1-8—Chicago pleasure car show; National Association Automobile Manufacturers.
February 3-8—Washington, D. C.
February 10-15—Chicago truck show.
February 8-15—Hartford, Conn.
February 10-15—Minneapolis.
February 12-15—Geneva, N. Y.
February 15-22—Newark, N. J.

February 15-22—Albany, N. Y.
February 16-23—Richmond, Va.
February 17-22—Kansas City pleasure car show.
February 18-19—Madison, Wis.
February 18-21—Grand Forks, N. D.
February 19-23—Topeka, Kans.
February 19-23—New Orleans, La.
February 20-22—Canandaigua, N. Y.
February 24-March 1—St. Louis, Mo.
February 24-March 1—Memphis, Tenn.
February 24-March 1—Cincinnati, O.
February 24-March 1—Omaha, Neb.
February 24-27—Kansas City truck show.
February 26-March 1—Fort Dodge, Ia.
February 26-March 1—Glen Falls, N. Y.
March 3-8—Sioux City, Ia.
March 3-5—Cincinnati commercial show.
March 1-8—Pittsburgh.
March 3-9—Des Moines, Ia.
March 8-15—Boston pleasure car show.
March 11-15—Des Moines truck show.
March 12-15—Ogdensburg, N. Y.
March 18-22—Syracuse, N. Y.
March 18-22—Truck show, Buffalo, N. Y.
March 19-26—Boston truck show.
March 20-24—New Orleans, La.
March 24-29—Indianapolis.

Brake Designs on Many European Cars



Differential on Pipe brake gear; Bayard brake adjustment; Aries brake adjustment; La Buire rear axle and brake

Passing of Transmission Braking Noted at Paris Salon

PARIS, Dec. 21—One of the features of the Paris show is the attention given to brakes, with the remarkable landslide towards the use of both sets of brakes on the rear wheel drums. Two years ago only one firm adopted this method of braking. This year rear wheel brakes are not in the majority, but the number having just adopted them is so great as to be really remarkable. The French law stipulates that every car shall be equipped with two independent braking systems, of which one set shall act directly on the rear wheels. It has been the custom to put the hand-operated brakes on the rear wheels and to have a foot brake on the transmission.

Abandoning Transmission Brakes

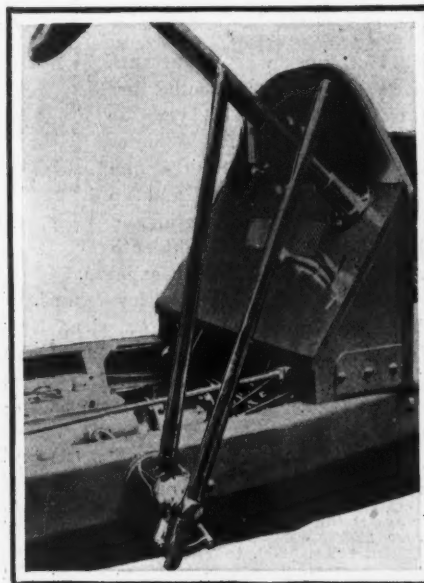
Among the firms having abandoned the transmission brake and placed both sets on the rear wheels drums are Panhard, Bianchi, Gregoire, D. F. P., Nazzaro, Charron, Sizaire-Naudin, Nielausse, Barré, Vermorel and Bayard-Clement. The undoubted value of the rear wheel brakes is the saving in wear and tear of the transmission; this is so well recognized that some of the firms maintaining the transmission brake have made it operative by the side lever, the pedal operating the rear wheel brakes; among these are Pipe and Delage.

The objections made against both brakes on the rear wheels are that they do not allow of such a quick stop from a moderate speed—such stops as often have to be made under crowded traffic conditions—and that under the most strenuous mountain touring conditions the heating of the drum is liable to make both sets inoperative. Correct design can remove this latter objection, and indeed it only applies to very long downhill work.

Practically all the rear wheel brakes are side by side and internal expanding type. There is not a single example of an external contracting brake on the European chassis. Nielausse has concentric drums; the others have the brake shoes side by side. The drums are made very big. As an example on the Charron, which is a car of medium power, having four cylinders of 80 by 150 millimeters, the width of the drum is 4¼ inches and its diameter 17½ inches. This is quite an average size.

Ribbed Drums Used

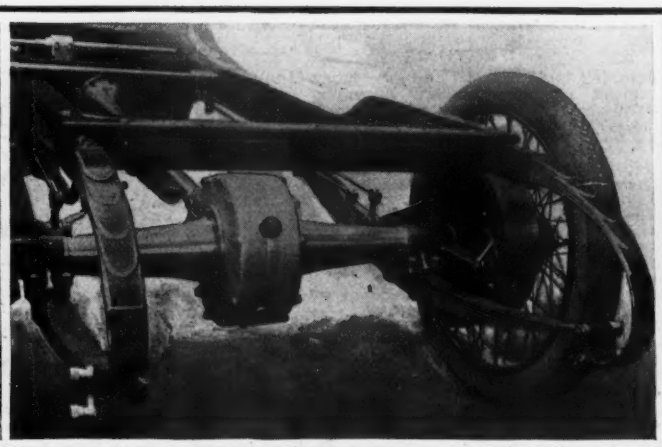
Bianchi and a few others in this class have ribs on the drums to assist in cooling. Ribbed drums are not confined to the rear wheel systems. Rochet-Schneider has both rear-wheel and transmission brakes ribbed, Renault now has an internal contracting transmission brake within a ribbed drum; Turcat-Mery doubtless has the biggest drum diameter,



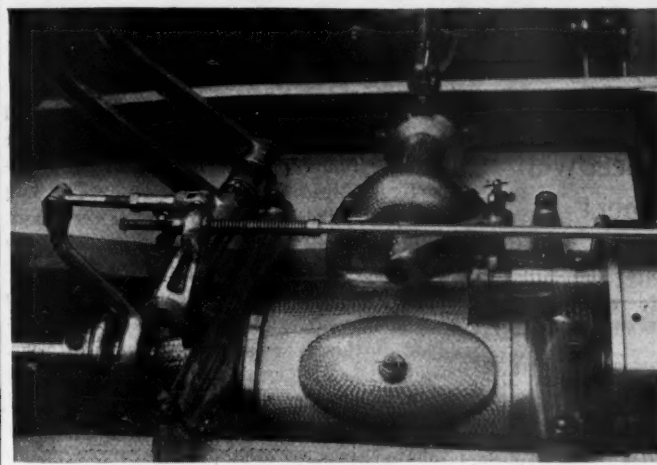
Spa with brake and change-speed levers independent



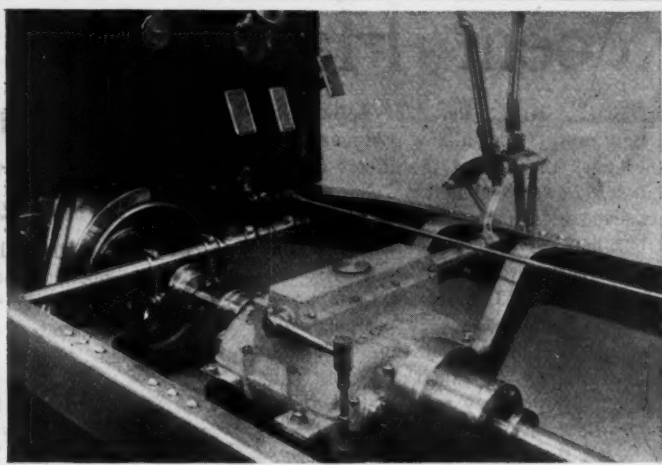
BRAKE CONTROL ON THE BUCHET



CHARRON SPRINGS AND BRAKES

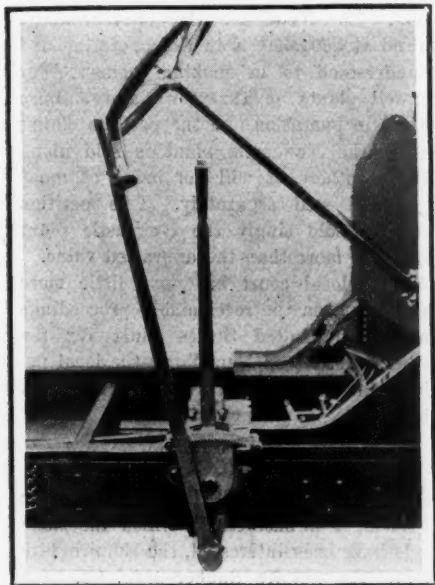


LA LICORNE WITH CHANGE-SPEED SECTOR INSIDE FRAME



DELAKE GEARSET ON SIX-CYLINDER CHASSIS

ribbed, on any transmission system. There is no uniformity whatever in the use of brake liners: every maker appears to have his own method, although the use of such materials as raybestos, thermoid, etc., is on the increase.



Bayard-Clement brake and change-speed levers mounted independently

Simplification of brake gear and brake adjustment is a very strong feature. Where there are two distinct sets of brakes—transmission and rear wheels—a very common, and at the same time, very neat arrangement is a single connection from the lever on the pedal shaft to the equalizer just above the differential housing. The front end of the connecting rod is threaded and has a bayonet type of winged nut. Thus the rear wheel brakes can be adjusted by lifting up the foot boards, and as the transmission brake adjustment is of the same type and at the same spot, it can be adjusted at the same time. This is the method adopted by Mors with the pedal-applied brakes on the transmission and the side lever brakes on the rear wheels, and also by La Licorne with the opposite combination.

Some Brake Adjustments

Delage has a somewhat similar system, but the adjustment in his case is made by a turnbuckle. The Bayard-Clement adjustment by worm gearing, is a very good system, as is also the worm-and-sector with a bayonet lock on the Aries.

A balancing mechanism is generally employed, and usually takes the form of a long, centrally pivoted bar. Methods of balancing by a cable with its ends at-

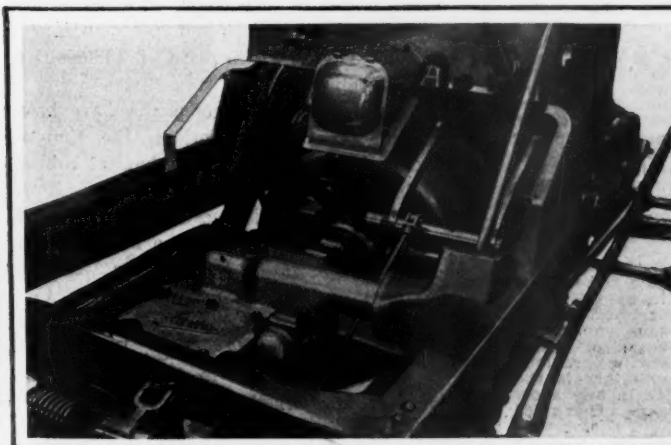
tached to the respective brake levers have considerably decreased in number. Wire cable for brake connections is, indeed, now very little employed.

Hotchkiss, Pipe and Renault are among the firms using a bevel pinion differential gear to equalize the pull on the brake levers. In each case the gearing is encased, as shown in the illustration. Delage, on the other hand, claims to get better results without an equalizer. La Buire is distinctive by reason of an external contracting brake on an extension of the propeller shaft to the rear of the differential housing. This has now been in use a couple of years.

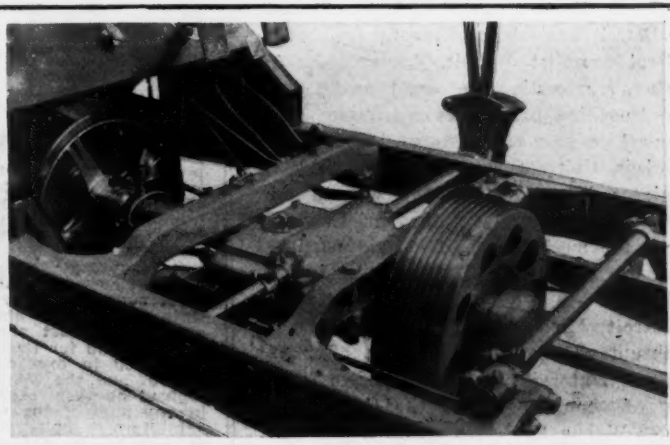
There is a tendency to mount the brake and change-speed levers independently instead of putting them on concentric shafts. An example of this is shown on the new Bayard-Clement chassis.

Front wheel brakes have not made any progress. Isotta-Fraschini makes use of them and has done so for a couple of years, but this seems to be the only continental firm now braking in this way. Rolland-Pilain formerly used front wheel brakes but has abandoned them.

Water-cooled brakes have gone out of fashion, Itala appearing to be the only firm making any use of them at the present time.



AUSTIN GEARSET WITH CHANGE-SPEED SELECTOR



TURCAT-MERY GEARBOX AND BRAKE DRUM

Recent Happenings in Motor Industry

DETROIT, Mich., Dec. 30—Referee in Bankruptcy Joslyn has postponed for another week the sale of the effects of the Grabowsky Power Wagon Co. The referee has received bids totaling only about \$175,000, but hopes to get more than \$200,000 for the property eventually.

The sale of the Lion Motor Co.'s property at Adrian also has been postponed by the referee for the second time. On the date first set for the sale the highest bid was \$7,000 for property appraised at about \$33,000. December 24 another attempt was made to sell the property, but on that occasion the highest bid was \$12,250, this being from Samuel L. Winternitz of Chicago. This sale likely will be confirmed, unless a bid of \$12,750 is received before the date set for the sale.

The Flanders Motor Co. has filed with the city clerk copies of a \$600,000 chattel mortgage, running to the Central Trust Co., to secure an issue of 6 per cent 3-year gold bonds, arrangements for which were made with the New York concern some time ago.

The Detroit Trust Co., receiver for the Flanders Mfg. Co., of Pontiac, has notified creditors to present their claims within 90 days, at which time an attempt will be made to have the property appraised. The factory is running at present. At the end of 90 days the creditors will hold a meeting with the receiver for the purpose of determining the future of the company.

The DuBrie Motor Co., adjudged bankrupt October 4, has filed a petition in the United States court, asking a full discharge of all debts provable against it under the bankruptcy acts. Judge Arthur S. Tuttle has set February 3 as the date for a hearing and has notified creditors to appear at that time and show cause, if any, why the prayer of the petitioner should not be granted. The company declares it has surrendered all its property and rights of property and has fully complied with the requirements of the bankruptcy acts.

In an effort to establish a prima facie case in the alleged patent infringement case of the North American Vehicle Co. against the Detroit Taxicab and Transfer Co., in the federal court at Detroit, Attorney R. A. Parker, representing the complainants, took the deposition of Charles E. Wisner, mechanical designer and engineer, before E. P. Voorheis, United States court commissioner. Engineer Wisner's testimony was to the effect that he considers the variation between the mechanism of certain portions of the truck and the Huber patent immaterial.

Detroit, Mich., Dec. 31—The referee in bankruptcy today accepted the offer of Samuel Winternitz & Co. of Chicago for a part of the property of the Grabowsky Power Wagon Co. Winternitz & Co. will sell the material and machinery and turn \$55,000 over to the referee. The bid cov-

Grabowsky and Lion Sales Postponed—Speedwell Announcement

ers everything but the land, buildings, equipment, book accounts and bills receivable. The real estate will be sold by the referee at auction January 23 at the plant.

GRAMM COMPANY ELECTS WILLYS

Toledo, O., Dec. 28—John N. Willys, president of the Willys-Overland Co., Toledo, was elected president of the Gramm Motor Truck Co., at the annual meeting of the stockholders of the corporation in Lima Thursday evening. Mr. Willys has announced that the facilities of the plant will be doubled early in the new year and that the company will install special equipment for the building of a $\frac{3}{4}$ -ton truck to be placed on the market at a moderate price. The plant is now turning out 1-ton trucks. It is also announced that H. H. Doebring, for several years general sales manager of the Ohio Electric Car Co., of Toledo, has been made sales manager of the Gramm Motor Truck Co., with headquarters at Lima. Mr. Doebring will have entire charge of the selling end of the business.

SPEEDWELL ADOPTS MEAD MOTOR

Dayton, O., Dec. 28—The Speedwell Motor Car Co., has just arranged a bond issue of \$150,000, which has been subscribed. The proposition of increasing the capital stock of the company to \$600,000 will be submitted to the stockholders immediately. This bond issue was planned to take care of the extension of the Speedwell product, involving the use of the Mead rotary-valve six-cylinder motors on a portion of the output of new pleasure cars. The Speedwell company has taken a license under the Mead patents for the Mead rotary-valve motor.

PARIS SHOW A RECORD-BREAKER

PARIS, Dec. 22—With the record number of 550,000 persons having paid for admission, the thirteenth French show closed its doors this evening, after having been open 16 consecutive days. No accurate record has been kept of the number of persons having entered the big hall with free tickets, these persons comprising stand attendants, agents, officials, pressmen and persons have received invitations on the opening day. It is estimated that altogether nearly one million must have entered the Grand Palais while the show has been in progress.

It is evident that the show which has just been brought to a close is the most successful ever held in France. Gate receipts are about \$6,000 in excess of the best previous years; the amount paid for the rentals of stands is \$40,000 in excess of the previous record, and the 568 exhibitors is the highest number recorded in any show in any part of the world. These 568 exhibitors occupied 260,000 square feet of floor space, paid at rates varying from \$50 to \$6 per square yard.

The new Speedwell car has a standard chassis that is built to accommodate either a six-cylinder poppet-valve motor or a six-cylinder Mead rotary-valve motor. The cars will be alike except for the power plant, either type of motor being furnished at the customer's option, and at the same price.

A limited number of Mead motors will be built this current season, while a large output of this type is planned for next year.

W. L. Caten has just assumed the office of vice-president and general manager of the Speedwell company. This involves no change in any other officers of the company, it is said.

WANT A SEPARATE SALE

Indianapolis, Ind., Dec. 30—All of the Indiana creditors of the Maxwell-Briscoe Motor Co., a subsidiary of the United States Motors Co., have joined in a petition to the superior court in this city, asking that when the Maxwell properties are sold, January 8, the Maxwell plant at Newcastle be sold singly. The Newcastle plant has been appraised at \$664,000, is in full operation and is understood to be making money. The Maxwell plants at Tarrytown and Auburn are not in operation and the petition claims that if the Newcastle plant is sold along with the others, it will not bring as much as though sold separately. The petition says that sold singly the Newcastle plant may bring more than the appraised value.

As the local court has done little more than to confirm the receivership proceedings against the United States court for the southern district of New York, the local petition may be referred to the New York tribunal.

EMPIRE TIRE REORGANIZATION

New York, Dec. 28—Bringing together two ends of a business in which the same people have been interested, the Empire Tire Co. and the Empire Rubber Mfg. Co. have been consolidated into the Empire Tire and Rubber Co., with the plant remaining as before at Trenton, N. J. The new concern is capitalized at \$1,000,000, of which \$500,000 is in common stock and \$500,000 in preferred. This is an increase of \$500,000 in the capitalization.

Heretofore the two companies have been running separate institutions, the Empire Rubber Mfg. Co. making mechanical rubber goods and the Empire Tire Co. tires. Now, as one concern, both mechanical rubber and tires will be made under one management. In the reorganization H. G. Baker, who was president of the Empire Rubber Mfg. Co., becomes president of the new concern, succeeding C. H. Semple; H. G. Baker, formerly of the Rubber Mfg. Co., is vice-president; A. B. Cornell, who was secretary of both concerns, is secretary; while C. Edward Murray will be treasurer and general manager.

Two Cities After Road Racing Classics

SAVANNAH, Ga., Dec. 30—The date and other details of the grand prix and Vanderbilt cup races, which will in all probability be held in Savannah, over the famous Chatham county course, either in the fall of 1913 or early in 1914, will be arranged at a meeting to be held in New York on January 6 between the Motor Cups Holding Co. and a sub-committee from the executive committee of the Savannah Automobile Club.

This is the announcement of Harvey Granger, president of the Savannah Automobile Club, who has just returned from New York, where he was in conference with Henry Sanderson, vice-president of the Motor Cups Holding Co. William K. Vanderbilt, president of the company, is at present in Europe.

It is stated by President Granger that there is a possibility of the races being held on February 22, 1914, instead of Thanksgiving day, 1913, as heretofore, the former date being favored by the Automobile Club of America. This question, however, has only been slightly discussed. The date will be definitely fixed at the meeting in New York.

Milwaukee in the Field

Milwaukee, Wis., Dec. 30—It is announced today on the very best of authority that Milwaukee will stand sponsor for the international road races, the grand prix, Vanderbilt cup, Pabst trophy and Wisconsin Challenge cup races in 1913, if the governing bodies, the Automobile Club of America and the American Automobile Association will again consider its tenders favorably.

Immediately after the fifth annual Milwaukee motor show, which is to be given in the Auditorium from January 11 to 17, inclusive, the Milwaukee Automobile Dealers' Association will begin preparations for its campaign to land the classics a second time, and a delegation will leave for New York to make its tender to the governing bodies.

The \$43,000 deficit incurred by the races in October is being cleaned up rapidly, and with the prospect of a considerable profit from the show this month the last of the bills will be liquidated and the society of dealers again will be on its feet firmly and solidly. There will be no trouble about getting sufficient financial backing after that to more than insure a successful road race meeting under the revised system of participation which is now being worked out along new lines, which include the best points of the systems used at Elgin, Santa Monica and other points where road races have been held in the past.

RACE ACROSS IOWA

Des Moines, Ia., Dec. 30—The most unique motor race ever held in Iowa was pulled off Saturday, when Don McClure, of Oskaloosa, beat Peter Peterson, of Davenport, into Council Bluffs by 36 minutes after a daylight run across the state. McClure followed the White Pole road, while Peter-

Savannah and Milwaukee Asking for Vanderbilt and Grand Prix

son used the River-to-River. McClure drove an Oakland, while Peterson piloted a Pope-Hartford.

The race was a result of the great rivalry between the two most enthusiastically organized cross-state highway associations in Iowa. When McClure checked in at Council Bluffs his speedometer showed 355 miles and the distance over the River-to-River road is 366. McClure was on the road 10 hours 42 minutes, while Peterson's time was 11 hours 18 minutes.

FIGHTING MARYLAND LAW

Washington, D. C., Dec. 28—Appearing before the district commissioners, Leroy Mark, who formerly had the privilege of issuing Maryland licenses to Washington motorists, urged motor car owners of this city to defer taking out the 1913 licenses for a few days. If they followed this plan, he claimed, it would result in considerable saving on the license fees, and under no circumstances would it cause any inconvenience unless they drove their cars across the border line between the District of Columbia and Maryland. While Mr. Mark is secretive about his plans, it is believed he has a good-sized weapon in his hands that will aid Washington motorists in avoiding, in a large measure, the excessive fees that are charged motor car owners of this city who ask for Maryland licenses.

ILLINOIS ASSOCIATION MEETS

Cairo, Ill., Dec. 26—The annual convention of the Illinois State Automobile Association held at Cairo proved to be one of the most successful in the history of the organization. An interesting feature was the presence of all of the officers of the

Illinois Highway Improvement Association. The Cairo Automobile Club entertained the delegates with a luncheon at the Halliday hotel and also gave them a motor tour over the gravel roads of Alexander and Pulaski counties. After the banquet a night session was held at the Elks' Club.

WILL FIGHT LICENSE REVOCATION

New York, Dec. 28—Announcement was made last Thursday by the receivers of the United States Motor Co. that the notice of cancellation served upon the Dayton Motor Car Co., with reference to the license of that company under the Knight sliding-sleeve engine patents, had been declined on the part of that company.

Counsel representing the Dayton Motor Car Co. have advised the company that in their opinion the contract between the Knight company and the Dayton Motor Car Co. contains nothing upon which such cancellation order can be based, predicated upon any act so far performed by the Dayton Motor Car Co. A lively tilt in the courts is promised.

BOSTON TALKS SHOW PLANS

Boston, Mass., Dec. 28—The Boston Automobile Dealers' Association held a meeting recently, when the plans for the motor show in March were gone over. Manager Chester I. Campbell announced that the space for the first week has practically all been subscribed for now. There were a few concerns that found out at the last minute that it might not be possible for them to make any exhibit and so this allowed a number of others who were not on the list for space to reap the benefit of getting in. Others managed to get a little more room.

As many of the dealers are also officers and members of the Boston Commercial Vehicle Dealers' Association, they discussed the truck show at the same time. It was found that even now a larger number of exhibitors had applied for space next March than last year and the show will be more comprehensive. The tool makers' exhibition will be placed with the truck show. More space has been allotted this year to the Accessory Manufacturers' Association and this will enable the members of that organization to present an even larger exhibition.

BURMAN TACKLES MILE RECORD

San Diego, Cal., Dec. 26—Special telegram—Bob Burman made an attempt at the mile straightaway record of :25.40 on the San Diego beach yesterday before a crowd of 20,000 persons. He did :28 in his big Benz, equal to 128.66 miles per hour. On his second trial the car caught fire and Burman was forced to drive into the ocean to extinguish the flames. The damage to the Benz is estimated at \$4,000. In addition to the time trials, there were six other events contested.

PELLETIER AND SMITH RESIGN

DETROIT, Mich., Dec. 30—E. LeRoy Pelletier, advertising manager of the Flanders Motor Co., and Paul Smith, sales manager, severed their connections with the concern on December 28. No statement from the parties concerned or from the officers of the Flanders company could be obtained today relative to the reasons for the move. Since the merger of the Flanders Motor Co. with the United States Motors there has been considerable speculation as to whether these men would assume the same positions with the parent organization, and Saturday's move is the answer.

A newspaper report here today states that Pelletier and Smith were advertising and sales manager, respectively, of the United States Motor Co. at the time of their resignations, but this is incorrect. They were connected with the Flanders subsidiary only, and were not in the employ of the United States Motors in any capacity, although they had been slated for appointment later on.



Routes and

What San Antonio Has to Offer Motorists in the

By R. S. Israel

SAN ANTONIO, Tex.—Editor Motor Age—Until within the last few years much of the country to the north and northwest of San Antonio into the hills that mark the southern boundaries of the great Edwards plateau, was known only to the few persons residing therein, mostly sheep or cattle raisers; to the few traveling men who drove through it occasionally in a light buckboard to drum up trade, and to the sportsmen who penetrated into its fastnesses each fall, winter and spring seeking deer, quail and other game and finding frequently wild animals of a fiercer sort.

But the advent of the motor car first opened an era of good road building throughout this section of the state that has received additional impetus from the development attending the construction of the great dam of the Medina Valley Irrigation Co. across the Medina river at a point 40 miles west of San Antonio, thus creating a lake 18 miles in length, extending near to the town of Bandera, county seat of Bandera county, having a depth ranging from an average of 43 feet to 164 feet at the dam.

This dam and lake have aroused an interest in the possibilities of the adjacent country that has led to the construction of a number of new roads and several motor loops that are destined to be very popular among motorists, and especially with the thousands of tourists who come each winter to spend several months in this comfortable, happy, genial climate.

In scenic beauty this is one of the garden spots in Texas. The scenery compares favorably with any part of this country; its rocky hills have rugged beauty such as attracts visitors to Colorado and other western states; they are timbered principally with oak and cedar; its streams flow through many deep canyons into cool, shadowy recesses where the sun may only peep, and their banks are lined with giant pecan trees, with hackberry, elm, cottonwood, fir and other trees.

The valleys contain fertile lands and, being protected by the high hills from the cold winds that sweep down when the snow king travels through the north, many of them are ideal for farm sites or for homes. It is a country that is good to look upon and good to live in.

When the construction of the Medina river dam was begun during the summer of 1911, the road was almost impassable



ANCIENT SPANISH FENCE ALONG MEDINA DAM ROAD, SAN ANTONIO

Inquiries About Routes

KANSAS CITY TO DALLAS

WATERLOO, IA.—Editor Motor Age—I would like the best route from Kansas City to Dallas, Texas.—L. L. Collins.

The Santa Fe trail should be used going west as far as Newton, a distance of 217 miles from Kansas City. Go through Westmoreland, Martin City, Olathe, Gardner, Edgerton, Ottawa, Williamsburg, Silksville, Waverly and Emporia, 134 miles; then through Plymouth, Saffordville, Ellinor, Cottonwood Falls, Elm-dale, Clements, Cedar Point, Florence, Peabody, and Newton.

The Meridian road is intersected at Newton. Keeping to this road all the way to Fort Worth, although it is known locally in Oklahoma as the Chisholm trail, continue south from Newton through Wichita, Wellington, South Haven, Caldwell, Renfrow, Medford, Kremlin, Enid, Hennessey, Dover, Kingfisher, El Reno, Pocasset, Chickasha, Verden, Anadarko, Apache, Lawton, Emerson, Randlett, and crossing the toll bridge over the Red river north of Burkburnett reach Wichita Falls.

About 8 miles south of Wichita Falls beware of mud hole in wet weather, and if bad go back about 150 yards and make a detour through the fields. You should next reach Windthorst, then Antelope, Jacksboro, Whitt, Weatherford, Annetta, Aledo, Ben Brook and Fort Worth.

Fort Worth to Dallas is 33 miles through Handley, Arlington, and Grand Prairie.

LIMA, O.—BATTLE CREEK, MICH.

Pandora, O.—Editor Motor Age—What is the best route from Lima, O., to Battle Creek, Mich., and what is the distance?—L. G. Steiner.

This trip can be made in a little over a day. Kalamazoo would be the stop for the first night with a distance of 162 miles on your speedometer. The towns along the way are Elida, Delphos, Van Wert, Fort Wayne, Huntertown, Laotta, Swan, Avilla, Kendallville, Wolcottville, Valentine, La Grange, Howe, Kalamazoo. The roads are all good, being either gravel or stone. Next morning continue on your way to Battle Creek, 23 miles through Galesburg and Gull Lake Junction. The entire 185 miles can be easily made in 1 day if desired.

beyond the Bexar county line, Medina county having done nothing up to that time towards improving its roads in the vicin-

ity of the damsite. Since then, however, much work has been done both by Medina county and by the Medina Valley Irrigation Co., and the dam may now be reached easily over several good roads.

The most popular way, the most traveled road between San Antonio and the Medina dam, leads directly west from the city. Almost immediately the road begins to climb and at a distance of 7 miles it tops a hill from which at a height of between 300 and 400 feet above San Antonio a fine view of the city may be obtained. For much of the way the road winds in and out among the hills, climbing elevations and then dropping down again, but always getting higher and higher. It runs beneath overhanging bluffs, which, rising to a height of 100 to 200 feet, show in their alternate layers of rock and gravel the outcroppings of the Edwards limestone, illustrating how this hard rock which underlies the greater part of the Edwards plateau forms a perfect catch basin and water-conveyor which feeds the artesian wells at San Antonio and in the country to the south and southwest of the city.

While the road crosses many bridges, nearly all of them span dry creeks, for much of the water in this part of the state flows beneath the beds of the channels, sinking through the gravel to the bedrock beneath, and comes up only in occasional pools. From the tops of the hills views may be had of the surrounding country for many miles in every di-

Touring Information

Way of Road and Touring Attractions in Winter



SECTION OF NEW MACADAM ROAD NEAR SAN ANTONIO, TEXAS

rection, the air being so dry and clear usually that hills 4 and 5 miles away appear as if only a mile distant or even less.

Evidences of the extensive sheep ranges that formerly existed are seen in the old stone walls, 4 to 5 feet high, that are passed all along the road, and in the old rock-walled sheep pens, the ruins of which are found at frequent intervals. These walls are built by placing one rock on another and are held in position without mortar. One wonders at the infinite amount of patient work that was necessary years ago to construct these rock fences and compares the cost of building them then with what they would cost today.

San Antonio lies at an altitude of 651 feet above sea level in the center of the city and 768 feet on the heights in the suburbs. The bed of the Medina river where the upper or main dam is placed is 920 feet, the bottom of the spillway is 1,072 above sea level, the top of the dam is 1,080 feet and the average height of the surrounding hills is 1,150 feet. In the midst of a beautiful environment, high above the sea, sheltered in a circling crescent of purple hills, the Medina river lake will lure the artist, the pleasure seeker and the sportsman.

Until the dam builders found this spot made by nature for the use of man it was regarded as belonging to the wild lands of west Texas, visited only by the cowboy or sheep herder trailing their charges while they grazed on the luscious grasses

growing on the hillsides and in the valleys or, during the open season, by the hunters who found here quail, deer and ducks in abundance and sometimes wild turkeys. Some of the valleys were occupied by farmers, but these, because of the difficulty in getting their crops to market over the rough roads that frequently were little more than cow paths, never attempted farming on any extensive scale, but were content to plod along year after year raising most of the foodstuffs they used and contributing little except children to the growth and progress of the country.

But the era of good roads, first promoted with any marked activity by the motor car, has brought about great development of many new sections of southwest and west Texas, and the discovery of great underground water supplies and sites where storage reservoirs might be constructed for the conservation of flood waters has brought about agricultural activity, for the rich, friable, fertile soils respond graciously to irrigation and the bright, warm rays of the sun give vigor to the growing crops so that these once little known and remote sections are acquiring recognition as the garden spots of Texas.

Intensive cultivation of the soil has brought trained farmers from more populous parts of the country and from northern Europe and lands that formerly brought their owners incomes of \$1 or \$2 an acre are now bringing them \$100 and \$200 an acre yearly. Good roads that

have helped to bring about this condition are now more necessary than ever, for the present-day farmer, especially those that irrigate their field and thereby get the best results, are as partial to the use of motor car as the prosperous city man.

Two roads have been logged to the Medina dam, one being 39.6 miles in length and the other just 40 miles. One route is by what is known as the Gallagher ranch and the Bandera road, the other by the Culebra and Castroville roads.

MERIDIAN TRAIL LOGGED

The final step was taken in logging the Meridian road, when John C. Nicholson, secretary of the Meridian Road Association, arrived in Galveston, Tex., from Winnipeg, Canada, having covered a distance of approximately 2,000 miles by motor car.

This road will be cut into divisions, corresponding to the states through which it passes. There will be the Canadian, the North Dakota, the South Dakota, the Nebraska, Kansas and Oklahoma division, and the north Texas and gulf division, the dividing line between these last two being Waco. It will be the duty of these state divisions to organize the counties through which the road will pass into county divisions, such county divisions to urge the construction of a permanent highway therein.

CHARTING CALIFORNIA DESERTS

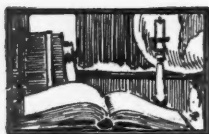
One of the most important pieces of work ever undertaken in behalf of motorists and overland travelers in general is the charting and marking of 1,500 miles in the desert districts of California. It is one of the most vital and far-reaching steps yet made in robbing the desert of its many dangers.

By the initial map made recently, the 1,500 miles to be covered in the desert districts will be the general territory bounded on the west by Palmdale, Mojave and Keeler, on the north by Revenue and the upper end of Death Valley, on the east by Rhyolite, Beatty, Needles and Parker. The southern boundary will touch Cadiz, Ludlow, Barstow and Victorville.

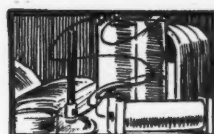
Not one but seven routes are to be marked and three of these will lead through Death valley. One of the routes will run lengthwise through the southern part of the nation's torrid sinkhole.

The preparatory work for this invasion of this territory has taken more than a year.





The Readers' Clearing House



Splash Oiling Explained

How Oil Is Introduced Into the Cylinders of a Motor Car by Usual Splash System

DENVER, Colo.—Editor Motor Age—Kindly advise me as to whether the oil that arrives at the top of the piston works there gradually by the working of the piston, or is drawn there by the suction of the exhaust.—Stedman Larzelere.

The oil that enters the cylinder of a gas-engine should never arrive at the top of the piston, as here it will only burn and carbonize, where there is nothing to lubricate. The oil that does enter the cylinder should be in the form of a very thin film over the portion of the cylinder walls on which the piston works. The usual manner of raising the oil to this position is by what is termed splash oiling. The crankcase carries a quantity of oil, at a pre-determined level, into which the connecting rod ends dip on the lower portion of their travel, splashing the oil up into the crankcase, the inside of the piston, and into the cylinder. The piston on its down-stroke swabs off the excess of oil on the cylinder walls, as a squeegee is used to scrape water off a window-pane, being thereby coated with oil. On its next up-stroke it encounters the relatively dry walls of the combustion space, on the upper portion of its stroke, and leaves part of its coating thereon. This is vaporized and to a certain extent burned during combustion, and passes off with the exhaust, being replenished by the piston on its next stroke.

There is no such thing as the suction of the exhaust. The exhaust stroke is a period of pressure. There is a suction, however on the intake stroke, but this has nothing to do with the induction of oil into the cylinder. If the rings allowed any such passage, not only would the compression be insufficient, but the expanding charge would find its way past the piston, and into the crankcase. Fig. 1 illustrates the manner in which oil is forced into the cylinder.

SINGLE PEDAL CONTROL

Oak Park, Ill.—Editor Motor Age—What cars have single-pedal control like the Chalmers, or connected pedals like the Lambert and similar to those formerly used by the Mitchell. I want a car I can operate on an emergency with one foot, as I have a weak ankle.—W. L. Agnew.

This form of control was formerly used by the Chalmers, Owen and Abbott-Detroit. It is now used by the Maxwell. Any car may be specially adapted to this arrangement.

HELPS COTTON-RAISER

CAVE SPRING, Ga.—Editor Motor Age—I notice in the issue of December 12 an article from Savannah, Ga., where a Georgia rural financier had figured out what great advantage would accrue to the farmers if every one would sell their cars and lend the money to the farmers. The article speaks of good roads and many other things of which motor cars are directly the cause, but it fails to state that this great financier was knocking one of the largest customers of cotton.

In 1906 I saw an estimate that 350,000 bales of cotton were used in tire and top fabric for motor cars. Surely we now are using 1,500,000 bales per year. That is why we can make 16,500,000 bales and get over 10 cents per pound. Before motor cars and other uses for cotton we found a 10,000,000-bale crop sold under 6 cents per pound.

What we want are eager customers for our cotton, ready to take it from the gin quickly and pay good prices for it; and not be forced to have no demand and have recourse to the money lender. Surely any sane man prefers quick sales and an active demand for his cotton at high prices.

No southern farmer that raises cotton should knock motor cars. If he does he just wants to stop and think. Then he won't.—Albert N. Tumlin.

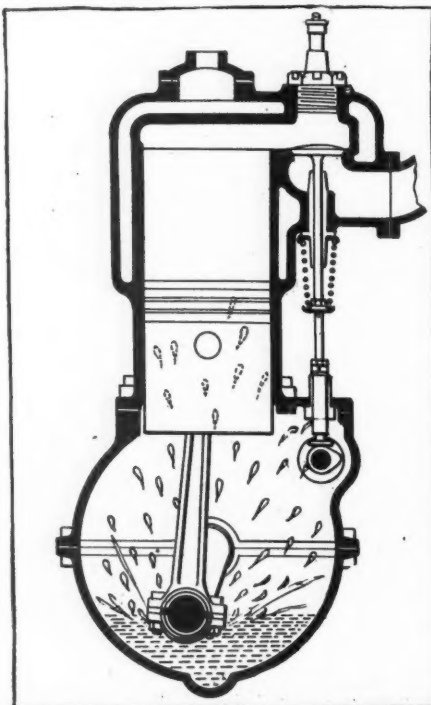


FIG. 1—DIAGRAM OF SPLASH

Increasing Tire Diameter

Change of Wheel Does Not Alter Gear Ratio, Although It May Increase Speed

PLEASANTON, Kan. — Editor Motor Age—Is the size of the rear tire taken into consideration in figuring the gear ratio of a motor car?

2—If I should change the rear wheel on my car from a 32, 3½ to a 34, 3½, would it change the gear ratio of the car?—A Subscriber.

1—The size of the rear tire has no more to do with the gear ratio of a motor car than has the size of the front tire or the steering wheel. The term gear-ratio refers to the ratio between the speed of the motor and the speed of the rear wheel. A ratio of 3 to 1 means that the engine makes three revolutions to one revolution of the driving wheels. The size of the rear wheel is always taken into consideration, however, in predetermining the gear ratio to be employed. A large wheel requires a lower gear than a small wheel. A wheel whose tire circumference is one-third that of a wheel used in connection with a 3 to 1 gear would require only a 1 to 1 gear, while if the wheel circumference is twice that of the second wheel, the gear ratio will have to be 6 to 1.

2—No. Such an increase in wheel diameter would not affect the number of revolutions of the engine required to turn it once. If you increased your tire size indefinitely your gear ratio would remain the same. Gear ratio refers to the number of engine revolutions required to turn the drivewheels once around. It is independent of the size, shape, number or anything else pertaining to the wheels, except their revolutions.

But, as your tire speed is increased by the increase in tire diameter, a given engine speed will produce a higher car speed, with a consequent loss of pulling power. With a 3 to 1 gear and at an engine speed of 1,000 revolutions per minute, a 32-inch tire will give 46 miles per hour, while under similar conditions a 34-inch wheel will give 48 miles per hour if the engine can propel the car at that speed.

This principle is illustrated in Fig. 2. From reference to this it will be observed that one revolution of a 32-inch wheel moves the vehicle 99 inches, and that with a 3 to 1 gear, each engine revolution moves it 33 inches. A 34-inch wheel, on the other hand moves it 106 inches, or 35 inches per engine revolution with a gear ratio of 3 to 1. This means that the engine is required to do more work, viz.: move the car a greater distance per revolution.

tion with the larger wheel, if the same gear ratio is used. To enable the engine to work under the same conditions with the larger tire that it did with the smaller, the gear ratio will have to be changed. This is done by increasing the gear reduction so that each revolution of the engine will move the car the same distance with the 34-inch wheel as it did with the 32-inch wheel. To determine what gear-ratio will accomplish this, the travel per revolution of the wheel is first found. This is shown by the figure to be 106 inches, 7 inches more than the 32-inch wheel. A 3 to 1 gear will therefore move the car 35 inches or $2\frac{1}{4}$ inches farther per engine revolution than the same gear with a 32-inch wheel. To make a 34-inch wheel turn at such a ratio of speed to the speed of the engine, that each engine revolution will move the car 33 inches, the gear ratio will have to be as the normal travel per revolution of the engine is to the wheel travel, or as 33 inches is to 106 inches, which we find to be as 1 is to 3.2. This is the gear ratio. It is usually expressed as 3.2 to 1, or $3\frac{1}{5}$ to 1, meaning that the engine turns three times to the wheel's one. A shorter formula is:

$$\frac{D'}{D} = \text{gear ratio}$$

$$\frac{106}{32} = 3.2$$

In which D is the original diameter of the wheel, D' is the proposed diameter of the wheel, and X is the original gear ratio. To find the gear ratio required with a wheel whose diameter is D'.

SPARKS IN SAFETY GAP

Victoria, B. C.—Editor Motor Age—Would a poor mixture cause sparks to appear in the safety gap of a magneto, or is there only one cause for it—the secondary current having no outlet?

2—Does Motor Age think the use of a spark-plug air pump is harmful to the motor in any way?—A Reader.

1—No, not this alone, although a poor mixture might bring a condition about that would constitute a secondary cause of a spark in the safety gap. The theory of the spark gap is that as long as a circuit is provided through the cables and spark plugs, the current will not jump the wide gap on the magneto, but if the spark plug circuit be broken, and the engine continues to turn the magneto, generating a high-tension current, it is allowed to escape across the safety spark gap, and thus prevent the burning of the windings. A rich mixture might so carbonize an engine that pre-ignition would result. If this pre-ignition occurred at the time that the spark was about to jump the spark plug, the increased pressure might constitute such a resistance to the electrical passage that it would jump the safety gap instead. Again, an abnormally rich mixture might cause the motor to overheat

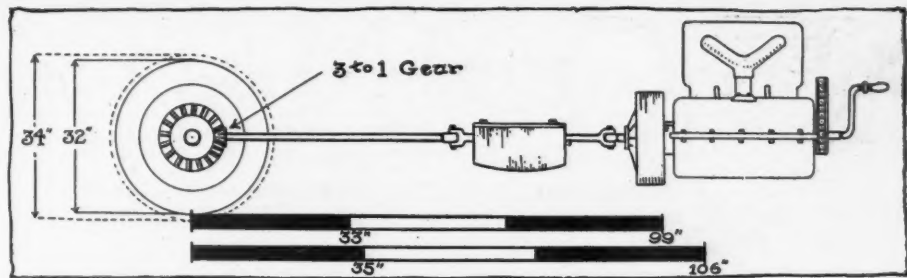


FIG. 2—EFFECT OF TIRE SIZE ON CAR TRAVEL

to such an extent that the sparking points would become warped, and the gap increased so that the current would find a more ready passage across the magneto spark gap than that of the spark plug. These conditions would be more likely to obtain in a single-cylinder motor than a multiple-cylinder type, as it is highly improbable that a given mixture would produce the same results in say, four different cylinders with four separate plugs.

2—The types that have come to the attention of Motor Age have not been of

such nature as to be conducive of harm to an engine, except the slight wear due to running with one cylinder missing, which, however, is almost negligible.

CURIOUS QUERIES

Strong, Colo.—Editor Motor Age—Would it be possible to build a five-cylinder gasoline engine? If so, how should the cranks be set, and what should be the order of firing, and how timed?

2—Has there ever been a five-cylinder engine built, and would it be a practical engine for motor car use?

3—Is the Cadillac built by the Buick people?

4—Motor Age recently printed an anti-freeze formulae. Was wood, or grain alcohol meant? If there is any difference, which would be the best?—C. W. Halford.

1—Five-cylinder gasoline engines have been built, and one is offered on the 1913 market. This is the Adams-Farwell, which uses five radical cylinders revolving about a stationary crankpin. The Adams-Farwell engine in four-cycle. To make a four-cycle vertical engine with five cylinders would involve unequal firing sequence with any crank setting, as the alternate firing of each cylinder requires that an even number of cylinders be employed. If, on the other hand, the engine be of the two-cycle type, the cranks would be set $\frac{1}{2}$ of an arc apart, so that the torque would be even. The proper firing order would probably be, for either type, 1-5-4-2-3, 1-4-5-2-3, or 1-3-5-4-2.

2—The Adams-Farwell has been on the market for several years, and whether or not it is practical may be judged from the fact of its survival.

3—No.

4—Grain alcohol, wood alcohol and denatured alcohol all freeze at about the same temperature, and are equally well adapted to use in anti-freeze solutions. Grain alcohol is the most expensive, while denatured alcohol is the cheapest, so that the latter is usually employed for this purpose.

ELECTRIC OWNERS IN ILLINOIS

Chicago—Editor Motor Age—Through the Readers' Clearing House columns will Motor Age tell me where I could obtain the names and addresses of electric pleasure car owners in Chicago.—Joseph A. Lee.

Address the secretary of state, of the state of Illinois, Springfield, Ill.



COMPARES BODY DESIGN

JEFFERSON, Ia.—Editor Motor Age—In a recent editorial Motor Age compares the body lines of American and European cars, somewhat to the detriment of the home product. In the foreign show section of the same issue are illustrations of numerous continental and British cars, presumably not selected for their lack of beauty. It seemed to me in looking over the issue in question that the pictures very successfully contradicted the argument of the editorial.

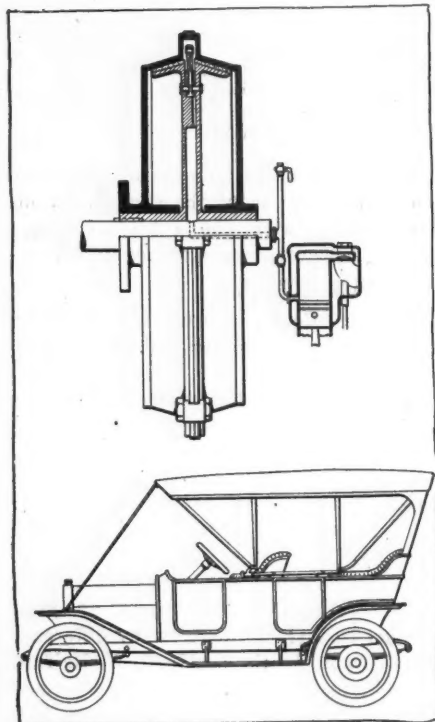
Doubtless the foreign maker is striving toward harmony in the design of hood, windshield and body. Also doubtless the average foreign car is an awkward, clumsy-looking vehicle as compared with any but the cheapest of our own products. It would seem that there are lines along which the American builder could profitably emulate the best European practice.

Can we compare with their records in fuel economy? Will our small-motored cars show as great power and flexibility as theirs? Probably not. But we certainly do get more car, more equipment, better design in the body, and more convenience for the money than our friends on the other side.

The past year has seen a growing tendency toward greater comfort in body design in this country, an increase in depth and improvement in design of the upholstery. What seems to have been largely neglected is an adequate provision for baggage and tools and tires. Let the body designer invite four friends, and at least two of them should be women, to take a 4 or 5-day trip in a five-passenger car. Then when they have their traps all piled on the front walk, let him take his drawing board and design a five-passenger body that will carry this amount of baggage conveniently, accessibly and securely, and the five passengers as well. What an enthusiastic reception that body would get!—C. D. Enfield.



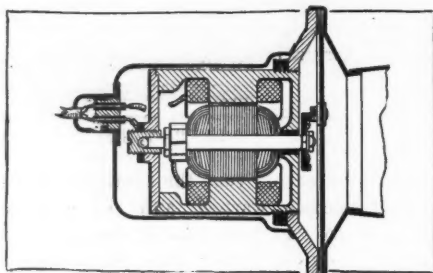
Current Motor Car Patents



DICKSON CLUTCH AND SMITH TOP

MOTOR Car Lock—No. 1,048,211—To Herman J. Richner and Edward H. Richner, Cleveland, O. Filed February 19, 1912, dated December 24, 1912. For the purpose of locking a motor car in such a way as to prevent the operation of same by unauthorized persons, but not preventing its movement about the garage floor for purposes of washing, etc., nor its removal from the garage in case of emergency; this device is a plate or casing secured to the dash of a motor car, within which is a combination lock, operating on a bolt. The bolt extends downward to the flywheel, which it is adapted to engage in such a manner as to prevent its movement. This device prevents the operation of the engine, but with the gear-set in neutral, the car may be pushed about the floor. The flywheel-engaging member is in the form of a pair of oppositely disposed dogs, engaging with lugs on the side of the flywheel, the dogs being operated by the lock bolt.

Motor Car Top Slide—No. 1,048,106—To Alice E. Smith, Elyria, Ohio. Filed September 9, 1910, dated December 24, 1912. One impediment to one-man operation of a large motor car top is the necessity in previous forms of disconnecting the front bows from their sockets, carrying them forward, and securing them in the forward sockets. This device, by means of a simple slide, enables the forward bows to be slid forward and back without lifting and without detaching them from the



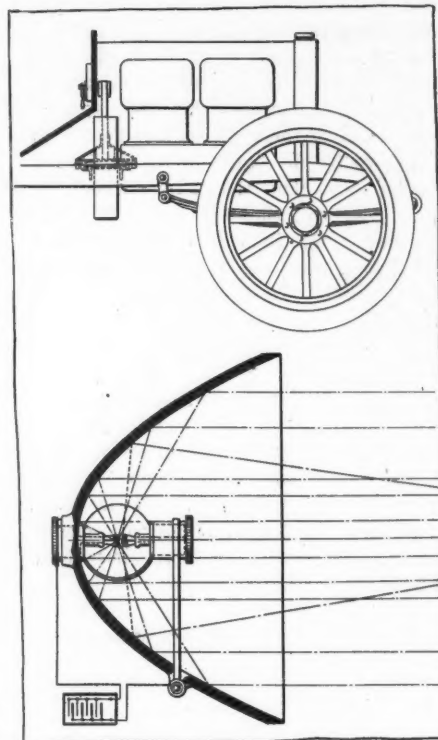
SPARKS HORN

socket. This rod is secured to the side rails of the body, the portions over the rear doors being separate from the rest, but meeting the other sections when the door is closed. The door section is rigidly attached to the door, so that when the door is opened the rod is carried with it, thus presenting no obstruction to entry and exit from the car.

Willard Lamp—No. 1,048,017—To Theodore A. Willard, Cleveland, O. Filed February 9, 1910, dated December 24, 1912. An incandescent lamp. This invention consists of a double-filament lamp, the filaments of which are in different foci on the parabolic reflector, the object being to render the liability of total disability of the lamp less imminent, and to eliminate the center shadow. The lamp consists of a casing with a parabolic reflector, at the center of which is a pair of lamp sockets, one at the peak of the parabola, and the other in front of it, and supported on a vertical column.

A double-filament lamp is disposed between these two sockets. The rear filament is in focus with the reflector, so that the light is shed in proper proportion except at the exact center, where the shadow of the forward filament is projected by the reflector in a straight line. The forward filament is out of focal adjustment with the reflector, so that its light is shed in a reverse cone, dispelling the shadow cast by the forward socket. The support of the forward socket is supported by a pivoted column, so arranged that with the rear lamp-base disconnected from the rear socket it may be folded out to permit of lamp-renewals. This construction permits of a special switch arrangement whereby the forward filament, which is out of focus with the reflector, may be left burning alone, eliminating the glare for city driving.

Pneumatic Clutch—No. 1,048,299—To James T. Dickson, Los Angeles, California. Filed July 18, 1911, dated December 24, 1912. This clutch is of the cone type, consisting of a casing with opposing cup-shaped faces within which are two faced cones, adapted to engage the faces of the casing. The cones are disposed on the peripheries of two disks, with a space be-



RICHNER LOCK AND WILLARD LAMP

tween them. The drive-shaft is rigidly secured to one disk and slidably to the other, permitting the second to slide upon the shaft. The casing is secured rigidly to the driven shaft. The driven shaft is drilled with a passage for air, this passage connecting with a line of piping embracing a cylinder tap and a reservoir. In action, when air is admitted to the air passage, it separates the disks, and forces the cones against the friction surfaces of the casing, causing it to turn, thus transmitting the drive from the driving to the driven shaft.

Electric Signal—No. 1,048,466—To William Sparks, Jackson, Mich. Filed May 9, 1912, dated December 24, 1912. Of the toothed-wheel type, this horn consists of a motor, the shell of which is in the form of a cup, the open end of which is covered by a removable cover. This cover has a bearing for the armature shaft threaded to it. The fields are wound about projections of the motor case, and an amplifying projection extends beyond the closed end of the cup. To the amplifier is secured a diaphragm and a projector. To the outer end of the armature shaft is secured a toothed disk, which bears on a button on the diaphragm. As the motor revolves, the toothed disk bears on the button, vibrating it and producing the desired warning sound. The threaded bearing in the motor casing cap may be adjusted by screwing in or out to vary the pressure of the toothed disk on the button.



The Motor Car Repair Shop



Rebushing a Square Wheel-Hub

THERE is a certain make of car in extensive use in which the driving shafts of the rear axle have squared outer ends that fit into squared holes in the wheel hubs. In this way the drive shafts are connected to the wheels to drive them. It has been found that after a reasonable length of time the squared holes in the wheel hubs take on the shape indicated in Fig. 1, the dotted lines indicating the original square shape of the hole. Thus the lost motion between the drive shafts and the wheels becomes so great that a sudden application of the clutch is very apt to result in a twisting off of the squared end of the shaft, or splitting of the wheel hub. Ordinarily the most feasible repair for this condition would seem to be the removal of the old worn wheel hub and replacement of it with another; rather expensive, but effective. An excellent remedy for this trouble has been discovered, however, and it is being applied with great success in a very large shop. This consists in cutting the humps out of the wheel hub and squaring up the hole; and then reducing the hole to the size of the shaft by fitting a square steel bushing into it. This bushing is made from steel tubing which is annealed and then squared by driving a square drift through it.

The square drift is tapered so that the square hole can be gradually formed and the tubing partially shaped by hammering it over the smaller squared end of the drift. By thoroughly annealing the tubing, that is, heating it to a cherry red and then allowing it to cool slowly in the ashes of the forge, or in lime, or if necessary in the air, it is possible to change it from the cylindrical to the square shape very easily; and at the same time stretch or expand it to the required size. Bushings of this kind are giving excellent service, and when they become worn they are easily replaced with new bushings.

The Noisy Rear Axle

The differential mechanism of a motor car rear axle is not the only noisy feature of the rear axle mechanism, for in the great majority of cases the differential mechanism is far less apt to wear sufficiently to become noisy than the bevel driving gears, for the differential mechanism is only in operation when the car is making turns, while the driving gears are always in operation. But noise from the rear axle does not always indicate that the gears are worn, for it is possible for badly worn gears to run quite noiselessly, while on the other hand it is also possible for new gears to be very noisy. However, noise from this mechanism does generally

Rebushing Wheel-Hub

mean that the gears are either in need of adjustment or lubrication.

One of the bearings of a motor car, which is usually neglected by the average motorist, is that of the driving pinion. An adjustment of this bearing generally requires that the operator get under the car, which is one reason for its neglect, but some makers render this adjustment more accessible by providing facilities for getting at it through the floor boards of the tonneau. It is important that adjustment be maintained in this bearing, as in all bearings; for lack of adjustment in

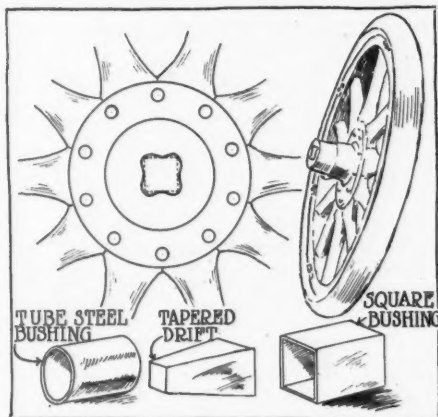


FIG. 1—METHOD OF REBUSHING HUB

this case is not only detrimental to the bearing itself, but also to the teeth of the pinion and driving gears, producing lost motion and mis-alignment, accompanied by a consequent excessive wear. The adjustment provided simply comprises a means of regulating the mesh of the driving pinion with the larger bevel gear, and the adjustment should be so made that the greatest freedom of rotation is obtained with the least lost motion.

Air Leaks and Carburetor Adjustment

To adjust a carburetor so the motor will fire regularly at slow speeds or when throttled down and running idle is quite impossible if there happens to be a leakage of air around the joints of the inlet gas manifold and the cylinders; around the spark plugs, valve caps or valve

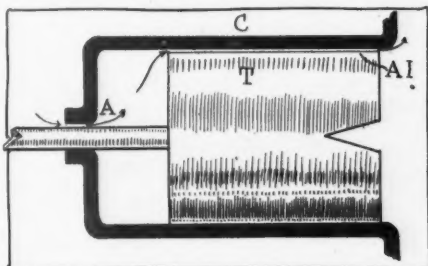


FIG. 2—REMOVING AIR LEAK IN PISTON-TYPE THROTTLE

guides; or around the joints of the carburetor itself. For instance, throttles and their operating mechanisms have been known to give much trouble in this respect; in Fig. 2 is shown a throttle of the piston type which had become worn and admitted so much air that the motor misfired at low speeds while operating under load.

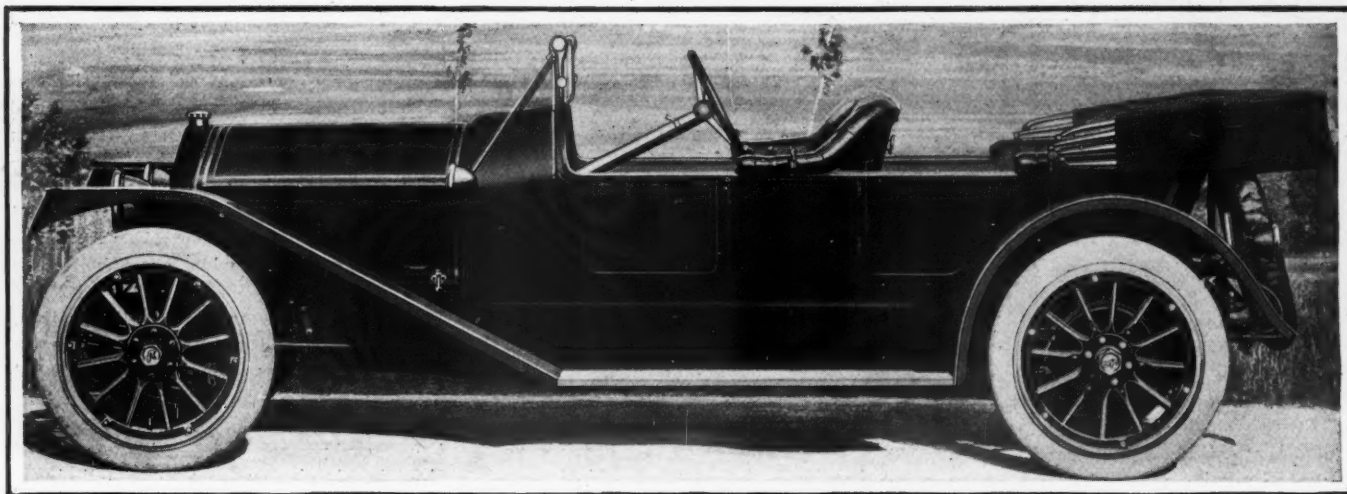
Though exaggerated in the illustration, the piston T and the rod as well, were worn so that air was admitted as indicated by the arrows A and I. In a large repair shop, where many of the cars cared for have carburetors with this type of throttle, it is customary to eliminate troubles of this sort by applying a coat of solder to the piston, and by tinning the entrance A also, or if necessary sweating in a small thin brass bushing as described above for a starting crankarm. A film of solder is an excellent remedy where the wear is too slight to make necessary the fitting of a new bushing or a carburetor piston.

Case Hardening

Very often the repair man complains that his wrenches and hammer heads are getting soft. The wrench, instead of gripping the nut firmly, slips around and the hammer head becomes dented more and more with use. This rapid wearing can very easily be remedied if such tools are case hardened properly. Wrenches, especially, lose their hardness after being used for some time and to retain the proper dimensions these tools should be hardened. Case hardening, as the expression implies, means a hard case or coat being added to the metal. This is accomplished in the following way: The wrench or other tool that is to be case hardened is allowed to remain in the forge until red hot, then quickly taken out and sprinkled with potassium cyanide and then allowed to cool slowly. The carbon contained in the potassium cyanide combines with the metal of the tool and forms a compound which is much harder than the tool metal itself. Of course there are materials that may be used for case hardening other than potassium cyanide, such as charcoal mixed with barium carbonate or ground charcoal alone. These various compounds may be bought cheaply at any drug shop.

The reason these different tools are case hardened is because they must necessarily withstand shock coupled with abrasion, the outer coat or case protecting the inner metal, the latter acting as a cushion. Gears, for example, in hitting against one another, would crack if they were hardened through, but when case hardened, the outer casing of hard metal takes up the wear and the inner soft metal gives the necessary cushioning effect.

Improved National Series V Announced



LEFT SIDE VIEW OF IMPROVED SERIES V NATIONAL TOY TONNEAU

SERIES V of the National product was announced early in the 1912 season as the output for the 1913 market. As the National company does not make yearly models, but adds such improvements as are deemed expedient without regard to season, a new series has been announced recently, which, still a part of series V, differs in minor improvements, and therefore is distinguished from this series by the term improved series V.

New Electric System

The general character of the machine has not been altered, but only modified by the addition of new features. Notable among these is the Gray & Davis electric starting and lighting system, small body refinements, and strengthening of chassis detail. Series V Nationals, as will be remembered, are four-cylinder long-stroke cars, with cylinders $4\frac{1}{2}$ by 6, cast in pairs, with valves on opposite sides, the valve stems, tappets and springs being inclosed in telescopic tubes, to render their action silent and to keep them clean.

The crankcase is rectangular in form, divided horizontally in the conventional manner, the upper portion carrying the bearings and having the supporting members attached, and the lower portion acting as a splash pit and oil reservoir. The circulating splash system of lubrication is used as in former models.

Slight changes have been made, however, in the cylinders, which do not now depend upon splash for lubrication, but are oiled by pressure, in the same manner as the bearings.

Double-distributor dual ignition is supplied by a Bosch magneto on the touring and toy-tonneau models, and by a Splitdorf magneto on the

speedway model. The same cone clutch, situated in the flywheel, and the three-speed gearset amidships, with the straight-line shaft drive to the floating rear axle. The camshafts have been made heavier in the new models, and specially-cut cams employed to reduce sound. The timing gears are now cut spiral to reduce wear and noise. The position of the fuel pressure pump has been altered, bringing it to a more accessible position; the tire pump has been provided with a positive clutch instead of the cone type, while the centrifugal water pump has been mounted on special brackets, which facilitate its removal. The fan has been slightly enlarged to increase its efficiency.

Detail Modifications Made

The frame on the touring chassis has been deepened to eliminate any possibility of sagging. The left-hand steering with center control that was used formerly has been retained in the new series. A special spring arrangement has been introduced in the steering post, eliminating all possibility of rattle. The flanges on the side of the fenders have been deepened, giving a more substantial appearance to the car and the tool boxes are located beneath the chassis frame, behind the running board, accessible through the splash guards.

Slight improvements are reported in the spring construction, which are said to eliminate all possibility of their settling, while in no way impairing their ease of riding. The braking surface has been enlarged, and the driving dogs on the drive-axle ends have been increased in size.

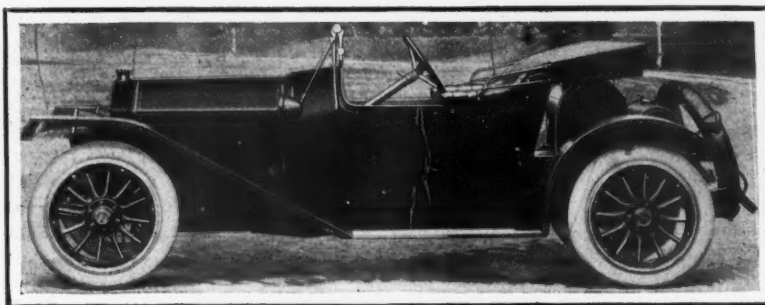
Using Hardened Bushing

Of especial import is the inserting of hardened steel bushings in a number of places about the car to prevent wear on essential parts, and to permit of replacing the wearing parts without renewing the parts.

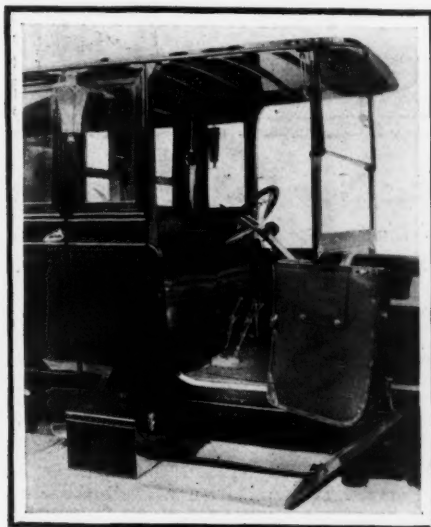
The foot-mat introduced on the touring cars of the original series V, has, in the improved series, been countersunk in the running board itself, so that it lies flush with its surface, greatly improving the appearance. The roadster body has its sides a trifle lower, and the curve of the back seat on the touring car has been increased. The dash boxes have been raised, and flush dash lights used instead of the former attached side lights. The space under the front seats has been left open from the rear, which will hold a small trunk or two suitcases, endwise.

The Gray & Davis generator is mounted at the front of the motor, and drives from the camshaft by means of a silent chain from the camshaft. The starting motor

is carried behind the flywheel, and drives through a series a reduction gears to the toothed flywheel. A round button at the right of the pedals operates the sliding gear that establishes this connection and at the same time with two separate switches. The first switch connects the motor with the battery through a resistance, turning it over very slowly,



ROADSTER OF NEW NATIONAL SERIES



LEFT-HAND DRIVE AND CENTER CONTROL
OF 1913 NATIONAL LIMOUSINE

which turns the sliding gear just fast enough to mesh easily with the flywheel teeth.

When the gears are meshed, the extreme pressure of the pedal closes the starting switch, and the current is fed direct to the motor, driving the engine at about 100 revolutions per minute, until the engine responds, when, at the release of pressure on the starting pedal, springs open the starting switch, and slide the gears out of mesh. When the engine is running, the motor and its attachments are out of service, while as an additional protection, the gear is fitted with an over-running clutch which prevents the armature from being driven by the engine at a speed sufficiently high to damage it. The battery is carried in front of the left running board, and furnishes sufficient current to run the car, should an emergency arise that required such use, and to

light the car for several hours without the aid of the dynamo.

Equipment and body appointments that are worthy of attention are the 12-inch turkish upholstery, full nickel trim, a slightly lengthened touring body, a new windshield, an electric horn, and improved tire irons.

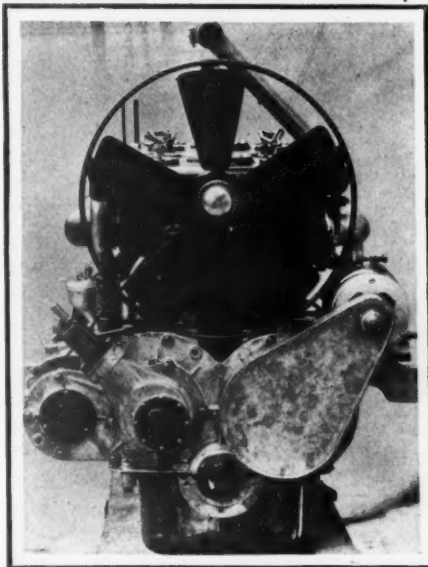
The Motorists' Bookman

History of South America

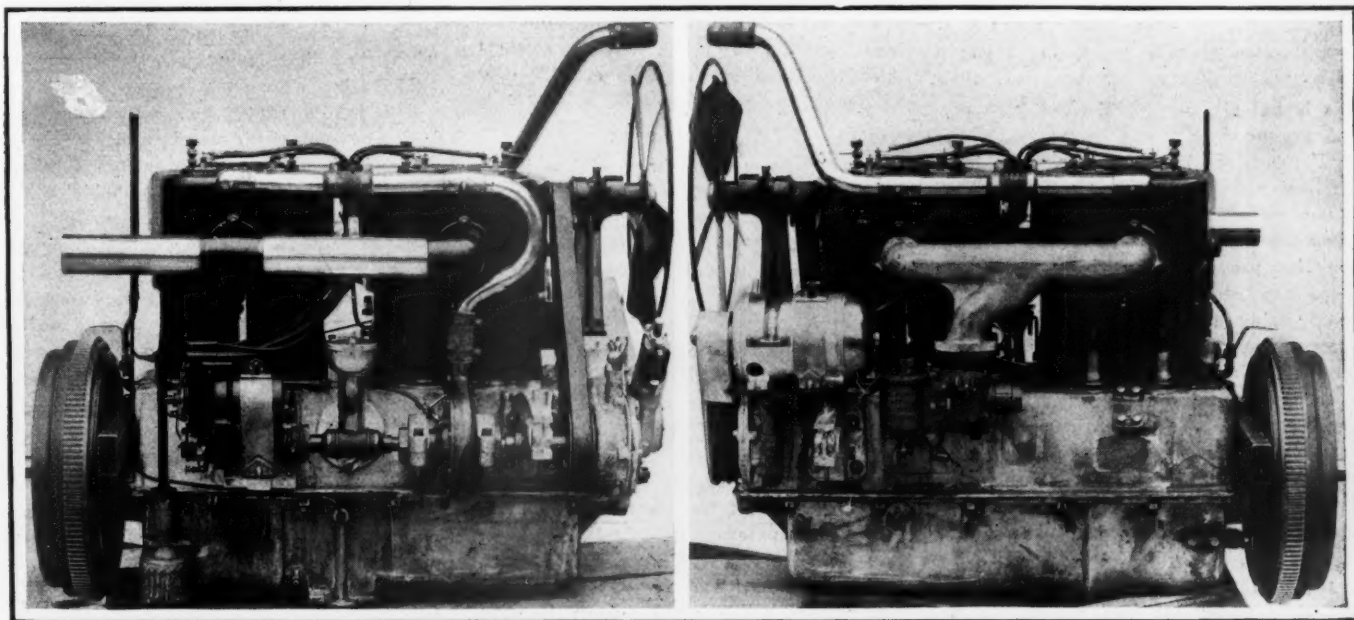
"OBSERVATIONS and Impressions of South America," by James Bryce, is a comprehensive history of the country lying south of us and made especially interesting just at present by our attention being fixed upon the Canal Zone that lies



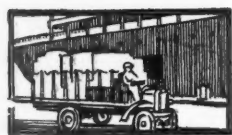
INTERIOR OF NATIONAL LIMOUSINE WITH
FOLDING AUXILIARY CHAIRS IN PLACE



between. The author felt a great curiosity to discover the causes that produced so many revolutions and civil wars in Spanish America, and still later these countries embracing such an economic factor in the modern world. To satisfy this longing the writer spent many months in securing and learning by observation and reports these things which he has so embodied in the pages of this book. Of particular interest is the history of Colombia and Panama and the descriptions given in regard to the events leading up to our becoming the possessor and builder of the great canal. The book will be of much interest to any one seeking a condensed history of the southern continent, and of value to those who are interested in the commercial activities of the growing expansion of such intercourse between the two countries. The Macmillan Co. Price, \$2.50.



THREE VIEWS OF IMPROVED NATIONAL MOTOR. TOP—FRONT END VIEW, SHOWING AIR PUMP AND INCASED SILENT CHAIN GENERATOR DRIVE. LEFT—EXHAUST SIDE, SHOWING MAGNETO PUMP AND FAN DRIVES. RIGHT—INLET SIDE, SHOWING NEW INLET MANIFOLD, GRAY & DAVIS GENERATOR AND TOOTHED FLYWHEEL



The Realm of The Commercial Car



Cost of Horse Operation Boston Pays \$5.02 Per Day for a One-Animal Rig

THAT the increase of motor trucks in New England in general and Boston in particular is bound to grow very largely this year is plain from the manner in which the owners of horse-drawn vehicles are going about the work of studying conditions.

There is in Boston an organization known as the Team Owners' Association that comprises more than 100 firms engaged in the trucking business. The greater number use horses, but more would be using motor trucks, perhaps, if they could get the information relative to costs comparing horse-drawn vehicles and trucks. So it was decided to go about the business the proper way. A circular was issued recently to the members stating that there has been so much discussion on the question of the cost of operating horse-drawn vehicles that it had been decided to get some figures on it.

William H. S. Jarvis, a public accountant, who has done much work for members of the association, was asked to delve into the figures, and then appear before the association and tell what he had learned. This he did a few days ago. In his report he said:

"To start with, there are 365 or 366 days in a calendar year. A horse, to take the horse as a unit, has to be fed, housed, maintained and cared for during the 365 days, but to get his earning capacity, excepting the unusual occasions of a few Sundays or night work, there should be a deduction of 52 days for Sundays and 9 for holidays, leaving 304 effective days. This is actually a reduction of 16 2/3 per cent or one-sixth.

"Further, for illustration, a large drayage business of just 200 horses, must of course, have from four to six driving horses for the use of managers and foremen in properly directing the work. There are spare or sick horses, which would bring the total of unproductive horses up to about twenty or just 10 per cent. Now these driving horses must be fed and cared for, as well as the sick horses and this takes off 10 per cent more from the 83 1/3 per cent left, which would leave about 75 per cent. Therefore, if it costs as it does at present, \$19.87 per month to feed a heavy draft horse, and there are 200 horses in the stable, it means an expenditure, at present prices for oats, hay, grain and other feed, of \$3,974, and to get the cost of keeping one draft horse effectively in the street per day divide by the number of horses, and make an al-

lowance for holidays, and this would be 90 cents per day per horse, from which you must not jump to the conclusion that anyone claims a horse actually eats 90 cents worth of feed per day.

"What it actually eats is 66 cents worth at present prices, and the rest is added as his proportion of that food eaten by idle horses, those that are sick, and that proportion of the holiday divided up on to the working day. The following tabulation will show the cost of operating single and double teams in Boston:

	One Horse Rig	Two Horse Team
Driver's pay per day.....	\$2.00	\$2.50
Feed per working horse per day..	.90	1.80
Rent and stable expenses per horse per day.....	.31	.62
Shoeing and small repairs per horse per day.....	.19	.38
Claims, accidents, tolls, etc.....	.18	.36
Foremen's and lumpers' pro rata..	.18	.36
Other helpers per horse per day..	.20	.40
Repairs, harness and painting....	.13	.26
Manager's or superintendent's sal- aries per day.....	.10	.20
Office rent, telephones and clerks..	.31	.62
Miscellaneous, veterinary, etc....	.24	.48
Fire and accident insurance.....	.08	.16
Depreciation for renewals of horses .....	.20	.40
	\$5.02	\$8.54

In conclusion Mr. Jarvis said: "It would seem from the above figures that any man that thought of letting a truck for \$8 a day or less is cheating himself, and if he will look over these twelve items he will claim, as he owns his stables, he does not have to pay stable rent, and as he puts his own time in, perhaps, working 15 to 18 hours per day, he is saved manager's salaries; but is that an intelligent way to run a business, and is not the transporting through the streets of a city like Boston millions of dollars' worth of costly goods and the largest amount of wool handled in any city in the world, with the possible exception of Liverpool, an important business?"

TO BUILD GAS TRACTORS

A company which will specialize in the manufacture of tractors propelled by gasoline motors has been organized at Appleton, Wis., under the name of Killen-Walsh Mfg. Co. and incorporated with a capital stock of \$100,000. The company has leased the Double Power Wind Mill Co.'s plant at Appleton and is already engaged in the construction of additions. The tractor to be produced is the design of William Strait, of New Mexico, who finally determined upon the Commercial Club of Appleton as giving the best proposition. The promoters of the company are W. H. Killen of Appleton; Walter L. Walsh of Eau Claire, Wis.; W. J. Walsh of Elmyra, N. Y., and William Strait. The Strait tractor is well known throughout the west, it being applicable, it is said, to any and all kinds of hauling by farmers, contractors and others.

Has New Delivery System Chicago Department Store Gara- ges Trucks in Its Sales Building

THE Boston Store of Chicago is to load trucks direct in attic and cellar, electric in the sub-basement and gas trucks on the fourteenth floor.

It long has been predicted that the coming of the motor vehicle with its greater speed of operation would mean the entire reorganization of delivery systems in many instances and the adoption of new methods of loading.

That such would be necessary in the case of the large stores in our big cities in the near future has been a thing of common knowledge for some time past, as many big department stores made minor changes in their shipping arrangements to fit the new deliveries. The Boston Store is to make a radical change in the near future if present plans are carried out. New motor vehicles already have been ordered to fit the scheme which it is intended to put into operation during the first part of this year.

Chicago department stores have had many things with which to contend in their city deliveries. The congestion of the downtown district has been so great that the authorities have virtually forbidden the putting on of any more horse vehicles from these stores or the loading at sidewalks of more vehicles than are in use now. The alleys are notoriously narrow in Chicago and furnish almost no loading space. To get around the difficulties large motor trucks have been loaded at the stores heretofore and sent to substations where the distributing to numerous small vehicles has been made.

This system saved the congestion of vehicles on downtown streets and especially at loading curbs and in the days when there were no small delivery vehicles reliable enough or dependable enough for house-to-house work this was the one way to facilitate deliveries. It was obviously useless to try to deliver parcels in house-to-house work with a 3-ton truck, which size was all that the firms considered practical at the time power vehicles were first adopted.

With the last 3 years' experience the downtown stores have become convinced of the practicability of the small cars of the present day, both of gasoline and electric types and have proved them out for parcel delivery. At the same time they have added to their fleets of big gasoline cars for furniture delivery work, this being a large bulk of the daily delivery volume of these stores.

As the small and fast vehicles have

UPPER FLOOR FOR LOADING 3-TON FURNITURE VANS



proved capable there has been a questioning as to whether a large part of the substation work could not be done away with and all deliveries sent out direct from the store. The scheme was feasible but for the loading and for this there was no space.

The police authorities of the Windy City also were dubious at first as to allowing a whole fleet of vehicles to be let loose through the most crowded part of the city at once during several periods of the day, but on understanding that the vehicles were all to be motor driven the consent was given to try out the scheme, since no matter how many started out at once they, with their speed, could be well out of the crowded district in 10 minutes from the time of leaving and could be timed to avoid interference with rush traffic hours.

This permission gained, the matter of loading was taken up with the result that in the future the electric parcel cars will be taken to the sub-basement of the store by elevator, here to be loaded direct in the shipping room. This will save hours in the loading time each day and will rush deliveries considerably.

The cars will be charged at the same platform. There will be loading space for fifteen vehicles at a time in the basement and if more are used they will load on schedule to prevent interference so that the loading spaces will be occupied as much of the time as possible. As soon as one vehicle leaves another can take its place. While this is going on in the second basement there will be other operations near the other end of the building, on the fourteenth floor.

To this floor which is built with a heavy concrete floor, will be lifted the 3-ton gasoline furniture cars and here, next door to the furniture room, they will be loaded from stock without rehandling and at great saving of time.

The whole system both in upper floor

and cellar it is expected will be a great timesaver and such further detailed systems of loading will be adopted as are found to best fit the cars with the facilities at hand.

MOTOR PIKE FOR GEORGIA

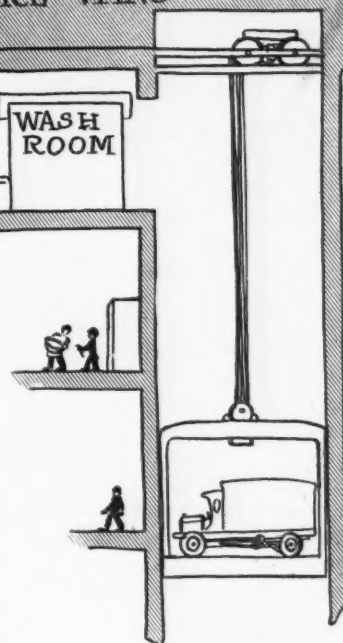
A novel common carrier will be built in Georgia within the next several months, when Dahlonga promoters will grade and equip a first class motor pike from that town to Gainesville, a distance of 21 miles.

Dahlonga has no railroad facilities, and the people of that section have to drive to Gainesville when going to other points. The Dahlonga parties will grade a first class pike over the distance and then put on a regular motor schedule for passengers and freight.

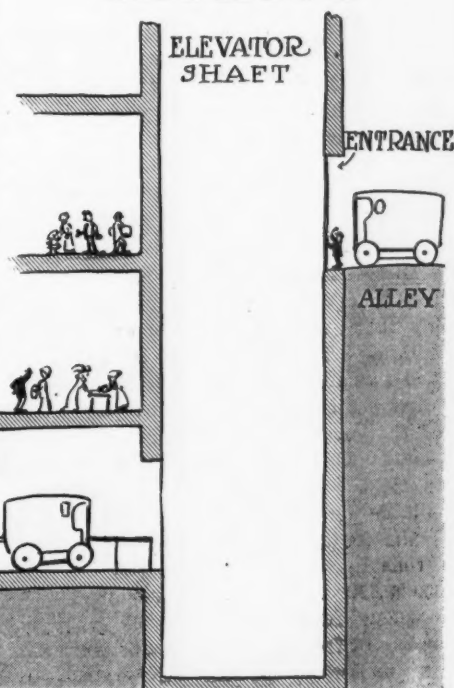
The promoters have taken the matter up with the state railroad commission to know if the enterprise will come under the jurisdiction of that body. As it is a common carrier the commission will probably take jurisdiction. The matter will be threshed out at a meeting of the commission to be held in the near future.

RUSSIA ORDERS WHITE TRUCKS

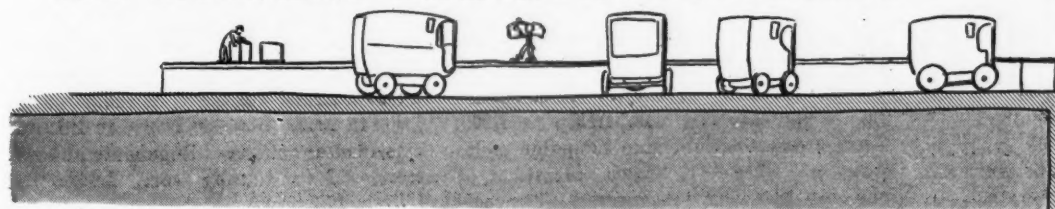
In carrying out the plan to put the Russian army on an active footing, to be ready for any emergency that may arise as an outcome of the present Balkan troubles, the Russian government has placed an order with the White Co., of Cleveland, for ten motor trucks of 3 tons capacity, fitted with special service bodies of standard Russian army design. The order came by cable, and called for immediate delivery. As soon as the bodies could be built, the trucks were crated and shipped by special train to New York city, and are at present on their way across to the Baltic. The order came to the White Co. as a direct result of the motor truck reliability trials held last summer by the Russian army, in which White trucks participated.



PROPOSED MOTOR VEHICLE LOADING- SYSTEM BOSTON STORE CHICAGO



SUB BASEMENT LOADING AND CHARGING





From the Four Winds



CORAL as Road Material—Coral is to be used in surfacing the new road which is to be built from New Orleans to the Southern Yacht Club's properties on Lake Pontchartrain.

Used to Transport Prisoners—A motor truck was utilized for carrying 250 prisoners from the old to the new state prison in Stillwater, Mich., several miles. Prison guards conducted the transfer in safety.

Mississippi Law Upheld—Mississippi's state motor license law has been upheld by the supreme court of the state. Owners subscribed to a fund to contest the law, which went into effect several months ago. Despite the fact that the best legal talent was engaged the court ruled that the state was entirely within its right in making the collection.

Tacoma to Shorten Course—Plans are now on foot to make a decided change in Tacoma's motor race course which will mean the shortening of the track from its present length of approximately 5 miles to 3½ miles. There are two dangerous curves near Lakeview, and it is planned to cut off the road altogether through the town of Lakeview.

Goes Back to Old Home—Taking back its original name, the Omaha Automobile Club, instead of that later adopted of the Auto-Motor, the club has elected officers, who are: President, Gould Dietz; first vice-president, Harry Lawrie; second vice-president, B. W. Jewell; treasurer, W. D. Hosford; secretary, Lee Huff; assistant secretary, D. M. Carr.

Alabama Law Attacked—The constitutionality of Alabama's motor license tax is under fire. H. E. Bozeman, who has undertaken to fight the regulation, cites article 220 of the state constitution which forbids the state from levying privilege taxes which are within the special province of municipalities. The defense of the state is that the license law provides for the division of the receipts between the state, municipalities and counties.

Direct Levies Favored—Extensive aid will be asked of the Ohio general assembly this winter in the campaign of road building. The movement to have the general assembly make direct levies for good roads has gained impetus since the defeat of the constitutional amendment to issue bonds. The new assembly will be asked to make a general levy of one-half of 1 mill for road building, the proceeds to be available in 1914 and thereafter. It is estimated that this would raise between \$3,000,000 and \$3,500,000 annually. The assembly further will be asked to appropriate \$1,760,000 to be spent under the present laws by the state highway commissioner. This would give each county \$20,-



PARIS SALON AT NIGHT, SHOWING MAMMOTH CHANDELIER

000 to be used in road building immediately before the proceeds of the tax levy would be available.

After Illinois Route—Manufacturers and business men of Davenport, Rock Island and Moline are raising a fund of \$100,000 to be used for permanent improvements on the Ocean-to-Ocean highway if the road is routed through the tri-cities. The Tri-city Highway Association is endeavoring to increase the membership to 1,000. An aggressive membership campaign under direction of A. E. Nissen, secretary of the club, has been inaugurated. The local road boosters are also planning a Chicago-

tri-city association to be organized on the same plan as the River-to-River Road Association.

Indianapolis Registrations—One of the best indications of the successful motor car business in Indianapolis during 1912, was the large increase in the number of motor car licenses issued by the city, as compared with 1911. The number of licenses issued was 3,466, as compared with 2,600 in 1911. Licenses issued in 1912 were classified as follows: Runabouts and roadsters, 1,300; touring cars, 1,802; light trucks, 172, and trucks of more than 1,000 pounds, 192.



Among the Makers and Dealers



PARIS SALON AT NIGHT, FULLY ILLUMINATED

PEERLESS Increases Stock—The Peerless Motor Co., of Cleveland, O., has filed papers with the secretary of state increasing its capital stock from \$3,000,000 to \$10,000,000.

Washingtonian Bankrupt—A voluntary petition in bankruptcy has been filed by Frederick K. Barbour, of Washington, D. C., whose assets are listed at \$4,438 and his liabilities at \$9,021. Some weeks ago an involuntary petition in bankruptcy was filed against the F. K. B. Co., motor supply dealer, of which Barbour was the head. The latter case is still pending in the bankruptcy court. In Barbour's individ-

ual case the court has awarded adjudication and has referred the case to E. S. McCalmont, referee in bankruptcy.

Will Not Issue Certificates—According to official announcement of the United States Motor Co. the receivers have decided not to take advantage of the authorization of court to actually issue the \$1,500,000 of receivers' certificates, permission to do which was given by United States District Judge Hough under date of October 28. The receivers state that pending the judicial sale of the properties, scheduled for January 8, manufacturing schedules will be followed only

as hitherto outlined, consisting largely of operations to maintain existing cars. The decision against issuing the certificates will result in delay of several months from the first of the year before the product of the company can be marketed.

Buys Miller Stock—James M. Hardie, who has been Chicago sales representative of the Miller Car Co., of Detroit, has purchased stock in the company, and has become secretary-treasurer and general manager.

Stoddard-Dayton Changes—John Dunwoodie has assumed duty as general superintendent of the Dayton Motor Car Co., the Dayton, O., branch of the United States Motors Co., succeeding J. H. Mertens, who has left the employ of the big merger. J. E. Burns, office manager of the company will remain it is stated.

Explosion in Gas Tank Plant—The plant of the Prest-O-Lite company, midway between Minneapolis and St. Paul, exploded at 5:30 a. m. one day last week. The watchman was killed. The loss was \$30,000. The explosion is believed to have come from the boiler, with the result that the plant ignited, although the state inspector says it did not.

Velie Increases Stock—Growth of the Velie concerns in Moline has necessitated expansion and increase in capitalization, and stockholders have just authorized two big issues. Capital stock of the Velie Motor Vehicle Co. will be advanced from \$600,000 to \$800,000 and that of the Velie Engineering Co. is to be doubled, the increase being from \$100,000 to \$200,000.

Buick Officers reelected—At the recent annual meeting of the directors of the Buick Motor Co. the following officers were reelected for the ensuing year: C. W. Nash, Flint, president; Thomas Neal, Detroit, vice-president; Standish Backus, Detroit, secretary; James T. Shaw, Detroit, treasurer; F. A. Allen, Flint, assistant secretary and treasurer, and L. F. Ohland, Flint, comptroller.

Failure in Milwaukee—The Bates-Odenbrett Automobile Co., 501-505 Broadway, Milwaukee, has been closed by involuntary bankruptcy proceedings. The petitioning creditors are: O'Neil Oil & Paint Co., with a claim of \$1,030; George W. Browne, a Milwaukee dealer, \$138, and Julius Andrae & Sons Co., Milwaukee electrical supply house, \$46. The company was organized about 11 years ago. George Odenbrett was killed by an explosion of a gas tank 3 years ago and since then Robert Bates has conducted the business alone. At the time of the failure the company represented the Abbott, White and Krit. It is believed that a reorganization will be effected.

Stewart-Morris Kerosene Carbureter

BECAUSE of the exorbitant prices that are demanded for gasoline abroad, particularly in England, the efforts of British inventors to devise a carbureter adapted to the use of low-grade fuels have been unflagging. Kerosene, or in English parlance, paraffin, has been selected as the favorite, as possessing the most fuel units per dollar of cost of any fuel available for use in motor cars. The supply of kerosene is of course almost unlimited and the price a mere fraction of that of gasoline—or petrol. Naturally this saving cannot be effected without extraordinary measures being taken. A carbureter for kerosene must be more than an atomizer with a throttle attached.

After 5 years of experiment, the Stewart-Morris carbureter has been placed on the market by the Stewart Precision Carbureter Co., London. Fig. 1 shows the type that recently underwent a test conducted under the observation of the Royal Automobile Club of Great Britain, as applied to an American Pathfinder car. These trials were conducted on the road, on the club's six standard routes, and on Brooklands track. The report of the technical committee in brief covers the following points of observation:

The total distance traveled was 2,003.3 miles, of which 1,001 miles were run on the road, and 1,002.3 were run on the track. The average road speed was 19.8 miles per hour, actual running time, while that on the track was about 35 miles per hour. The engine was started direct on kerosene twenty-three times, the longest stop after this was done being 17 minutes. On nine occasions the engine was started on kerosene direct, gasoline having been

injected previous to stopping beforehand. The longest stop before such a start was 45 minutes. The engine was started on gasoline twenty-one times, the shortest period after which the fuel was changed to kerosene being 10 seconds, the longest, 4 minutes 20 seconds. In the test 47.88 gallons of kerosene was consumed, an average of 20.91 miles to the gallon, or of 35.70 ton-miles to the gallon; 1.05 gallons of gasoline were used.

After the running test a slow engine-speed test was conducted in which the engine was run idle on kerosene for 10 minutes at a speed of 352 revolutions per minute. The speed was regular, with no misfiring. After this the engine was accelerated, and responded readily. A slow car-speed test was next made. The car was driven on high speed for a mile and a half at 6.14 miles per hour. The car was then accelerated, 39.2 miles per hour being attained in 51 seconds. The car was next run up a test hill at 11.16 miles per hour. At the conclusion of the trial, the engine was dismantled and found to be sooted with a little carbon deposit. This was ascribed to over-lubrication.

The distinctive features of this carbureter as distinguished from others of its type is that the same carbureter may be successfully used for either kerosene or gasoline, with the same adjustment. Its principle of operation is that of triple carburetion. The fuel enters the spray chamber and is atomized and mixed with air, upon which it is vaporized in a hot tube, passing through the exhaust manifold returning to the carbureter. On re-entering the carbureter the gas is passed through the mixing chamber. Here it is mixed with the auxiliary air in proportions depending upon the speed of the motor and passed on to the motor through the throttle.

In construction, Fig. 2, the carbureter consists of a body, within which a weighted valve is situated adapted to both hand and engine-suction manipulation. This valve is interconnected with a needle-valve in the lower or nozzle chamber so that the amount of fuel allowed to issue from the jet is controlled mechanically in accurate proportion to the air-valve opening, so that the engine suction has no direct effect upon the amount of fluid sucked up into the cylinders.

No float chamber is fitted, the fuel passing directly from the supply pipe through a dash pot to the jet orifice. The supply pipe is connected to the fuel intake by means of a T-connection, one lead of which conducts gasoline from a small tank preferably on the dash and at gravity pressure, and the other, kerosene from the main fuel tank, preferably situated at the rear, in which a pressure variable with speed is maintained. Suitable valves

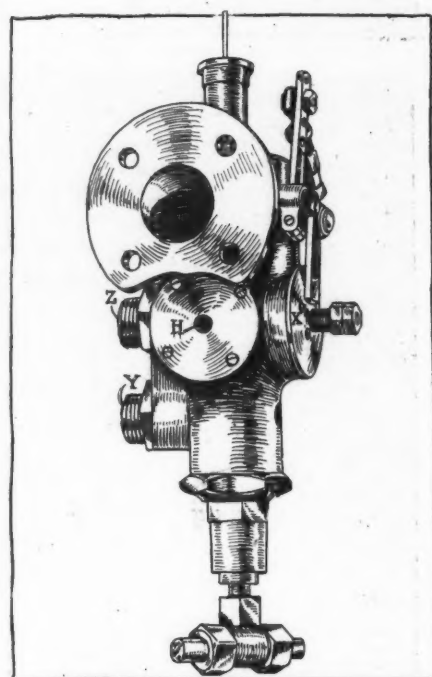


FIG. 1—STEWART-MORRIS CARBURETER FOR HEAVY FUELS

control the admission of one fuel or the other. From the supply tank the fluid enters a cylinder C, in which a plunger P is situated. This plunger is connected to needle-valve N, which is suspended from the valve-stem T. The fuel passes around the plunger P and through the orifice of the jet, whence it issues in the form of a fine spray to be mixed with air from the main air inlet A, being drawn from thence through pipe Y to the vaporizer. The vaporizer consists of a coil of pipe within the exhaust pipe, which thoroughly heats the carbureted mixture. It returns through pipe Z and enters the mixing-chamber. Here it is mixed with auxiliary air from the compensating-valve X in proportions proportionate to the throttle opening. This action is secured by a linkage connecting the butterfly-valve throttle with the shutter on the valve X.

For high speeds auxiliary air is taken in at valve H as determined by a hand-operated control. From the mixing chamber the gas is drawn into the motor through a slot in valve V, and in so passing lifts this valve. As the suction increases the amount of air passing this valve is greater, so that it is raised higher, simultaneously opening the nozzle-valve N wider and allowing more fuel to be carbureted. The valve is maintained in its proper position by the balancing piston B.

In use, to start the motor cold, the kerosene supply being shut off the gasoline supply-valve is opened and the motor started on this fluid. As soon as the motor responds the kerosene supply cock is opened and the gasoline supply shut off. For all ordinary running the auxiliary air

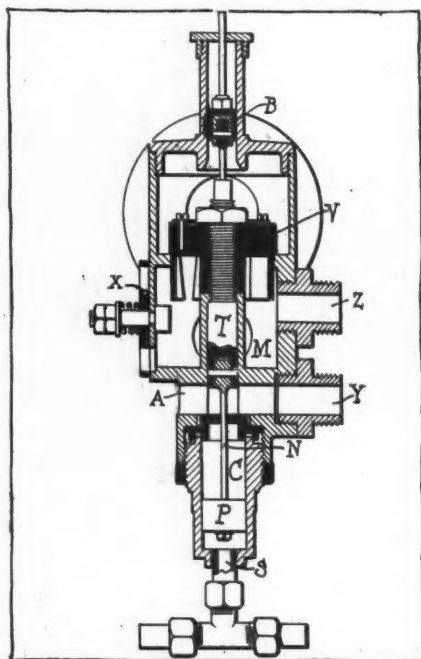


FIG. 2—SECTIONAL VIEW OF KEROSENE CARBURETER

Development Briefs and Motoring Novelties

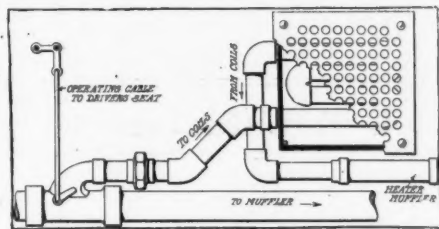


FIG. 3—AMERICAN EXHAUST HEATER

is taken care of by the throttle linkage, the throttle control being as usual. For higher speeds and for heavy pulling on low gear the hand-controlled air inlet is opened, being operated exactly like a throttle. In stopping the motor, the kerosene supply is cut off and gasoline gas allowed to fill the cylinders on the dying revolutions of the engine. If the stop is not to be a long one, the change of fuel need not be made, as the motor will start on kerosene if the motor is warm.

Difficulties have been experienced with supply cocks leaking, kerosene being a very searching fluid. For this reason, three-way valves cannot be used for the fuel supply, but individual cocks must be fitted for each feed. The tank for this reason is preferably situated at the rear of the car, where there is no danger of ruining the body finish or trim with the kerosene. Cocks that will not leak, being so hard to find, the makers of the carburetor furnish two with each instrument. Inasmuch as the pressure of the fuel-feed plays such an important part in the proper functioning of the carburetor, special pressure gauges are supplied with each outfit.

Pressure may be maintained in any of the customary ways, about 3 pounds to the square inch being the average normal pressure. Subsequent refinements will no doubt bring out a simplified control that will operate the fuel supply-valves, govern the pressure, and operate the auxiliary air in association with the hand-throttle. Various grades of heavy and illuminating oils may be used with this carburetor, which is made possible with the minimum of adjustment by the elimination of the float feed. Heavier supply pressures than lighter grades.

Verges Pneumatic Safety Clutch

The Verges pneumatic clutch is designed to prevent grabbing by means of a cylinder and piston construction of the members of the clutch, by which an air cushion is made to make the clutch action smoother by a dash-pot action. The clutch, Fig. 4, consists of an otherwise standard cone clutch, the cone of which is fitted with a cylindrical projection, open at the front. Within this is a piston, with a packing ring, which is secured to the flywheel. The spring and actuation linkage is in the usual manner.

In the figure, A is the air cylinder in

which the piston P works. R is the packing ring, which is used to secure compression. When the clutch is pulled back out of engagement, it cannot jerk back into engagement, but must return gradually. No resistance is exerted to the backward movement of the clutch, as air is readily admitted to the cylinder through the check-valve C, but on the motion being reversed the check-valve closes, and the air is allowed to escape from the cylinder at a slow rate through a small adjustable passage in the valve. By regulating this valve the speed of engagement may be varied. The advantages of such an arrangement are that if the foot of the operator accidentally slips from the clutch pedal, the clutch is not allowed to jam and grab.

Strickland Spark Starter

The Strickland starting device is essentially a part of the motor, and the motor therefore is capable of starting itself without the aid of external contrivances. This is accomplished in this device by revolving the camshaft independent of the crankshaft, or with stationary pistons, in other words, while interfering in no wise, it is asserted, with its proper and accurate functioning in normal running.

The device consists of a ball-clutch in the hub of the camshaft gear, which causes the shaft to be driven by the gear when the latter is in motion, but permits the revolution of the camshaft forward, independent of the gear. A chain and sprocket, also fitted with a ball-clutch, is connected to a starting crank on the dash, so the crank may be used to turn the camshaft for starting, but remain idle when

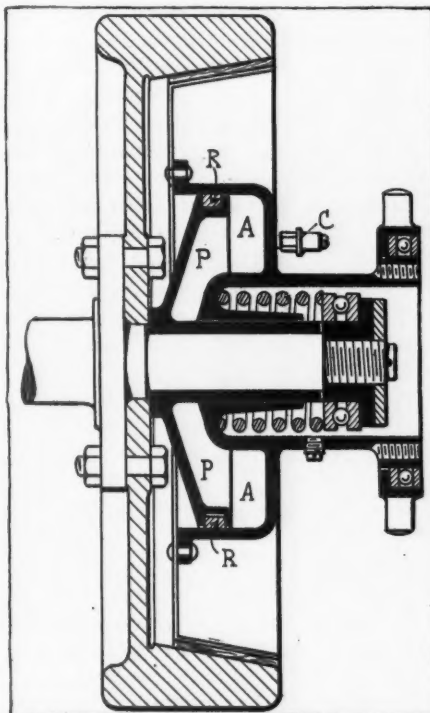


FIG. 4—VERGES PNEUMATIC CLUTCH

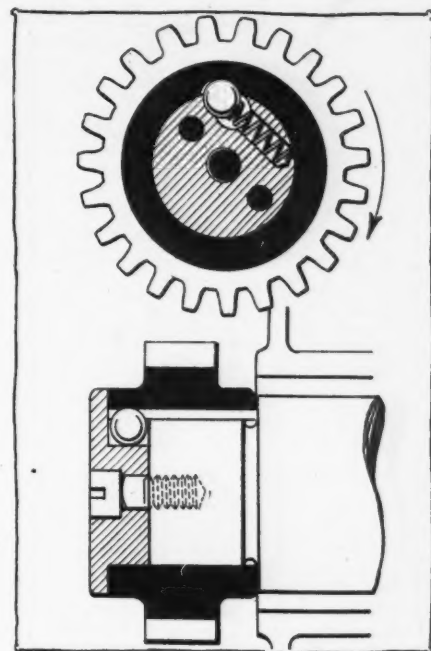


FIG. 5—STRICKLAND STARTER RATCHET

the motor is running. The construction of these ball clutches is shown in Fig. 5. A foot button is connected to a valve on the acetylene tank pipe leading to the intake manifold.

In operation, the crank is revolved one turn, with the foot button pressed, thus putting the engine through one-half cycle, and drawing in a charge of acetylene gas into two cylinders. The spark is then switched on, the motor firing the charge of acetylene, and starting. The successful operation of the device depends upon the return of the camshaft back to the same position in which it was at the beginning. The Strickland device is the invention of S. A. Strickland, Detroit, Mich.

American Auto-Heater

Of the exhaust type, the American motor carwarmer, Fig. 3, is the product of the American Auto-Heater Co., Buffalo, N. Y. It consists of a radiating box covered with a perforated plate, designed to be inserted in the floor of a motor car. Within this box is a coil of pipe, connecting on one hand with the exhaust line, through a three-way valve, and on the other with a heater muffler. It is regulated by the three-way valve. This is controlled through a cable and bell-crank by the driver. A special valve is used for this purpose that when closed allows a free passage for the exhaust gases through it and cuts off the heater entirely. There is no cost of operation with this heater, as the heat liberated from the exhaust gases would otherwise be lost, and the cooling of the gases through the coils condenses them and serves to assist the small heater muffler in silencing the exhaust.



Brief Business Announcements



Agencies Appointed by Motor Car and Truck Manufacturers

PLEASURE CARS

Town	Agent	Car	Town	Agent	Car
Albany, Ore.	Crawford & Rawlston	Oakland	Massillon, O.	A. H. Coleman	Enger
Albany, Ore.	Crawford & Rawlston	Page	McCook, Neb.	McCook Mach. & Iron Wks.	Hupmobile
Beaver Dam, Wis.	E. H. Pashak	Enger	Milwaukee, Wis.	Hughes-McDonald Motor Car Co.	Garford
Berwyn, Neb.	F. Miller	Enger	Milwaukee, Wis.	Hughes-McDonald Motor Car Co.	Flanders
Binghamton, N. Y.	American-Marion Sales Co.	Marion	Milwaukee, Wis.	Hughes-McDonald Motor Car Co.	Ohio
Boston, Mass.	Donovan Motor Car Co.	Studebaker	Milledgeville, Ill.	Miller Brothers	Enger
Carroll, Ia.	Carroll Cartecar Co.	Cartecar	Montreal, Can.	Poiriere, Rossette & Co.	Enger
Cedar Rapids, Ia.	John E. Elgin	Enger	New Haven, Conn.	J. J. Laverty	Moon
Cleveland, O.	L. M. Danner	Enger	North English, Ia.	W. C. Carson & Co.	Enger
Cleveland, O.	W. H. Barger	Rambler	Pawnee City, Neb.	O. H. Schenk	Studebaker
Council Bluffs, Ia.	J. G. McLean	Enger	Red Oak, Ia.	Whitaker Implement Co.	Cartecar
Craig, Ia.	Craig Auto Co.	Moon	Rosenberg, Tex.	Rosenberg Auto Co.	Moon
Culbertson, Neb.	August Sinner	Hupmobile	Roseburg, Ore.	Howard & Smith	Oakland
Decatur, Ill.	N. Main St. Garage	Moon	Roseburg, Ore.	Howard & Smith	Page
Des Moines, Ia.	Means Auto Co.	Marmon	Salem, Ore.	James Sykes	Oakland
Eaton, O.	J. A. Longnecker & Son	Enger	Salem, Ore.	James Sykes	Page
Franklin, Pa.	E. Blakeley	Klinekar	San Francisco, Cal.	Dillon-Goodwin Co.	Moon
Geneva, Ind.	A. P. Harrison	Enger	Salt Lake City, Utah	G. S. Holmes	Speedwell
Goehner, Neb.	George Madison	Nyberg	Sharpsburg, Pa.	Aupke Brothers	Enger
Grinnell, Ia.	Brownell & LaGrange Co.	Enger	Shelby, Neb.	McBeth Brothers	Enger
Hamilton, O.	Orme Motor & Transfer Co.	Moon	Sioux City, Ia.	Bennett Auto & Supply Co.	Moon
Henderson, Tex.	Henderson Crow Co.	Franklin	Sunbury, Pa.	W. H. Weaver	Klinekar
Highland Park, Ill.	W. B. Ten Broeck	Franklin	Syracuse, N. Y.	Bradley J. Lane	Klinekar
Kansas City, Kan.	Security Garage, Repair & Sales Co.	Enger	Valentine, Neb.	Valentine Auto Co.	Hupmobile
Lincoln, Neb.	Goddard Auto Co.	Hupmobile	Vassar, Mich.	Miller Auto Co.	Franklin
Lockington, O.	S. S. Gabriel	Enger	Wall Lake, Ia.	Hopkins & Herrig	Moon
Logan, Ia.	Kennedy Brothers	Abbott-Detroit	Waterloo, Ia.	Cramer & Bennett	Franklin
Los Angeles, Cal.	Dwight Holmes	Speedwell	Waukesha, Wis.	Frank E. Shrader	Enger
Marcus, Ia.	Johnson, Petty & Johnson	Moon	Youngstown, O.	Regal Sales Co.	Moon
Maryville, Mo.	W. W. Jones Co.	Enger			

TRUCKS

Boston, Mass.	H. Ross Maddocks	Stewart	Philadelphia, Pa.	R. I. McEwen	Hatfield
Los Angeles, Cal.	Dwight Holmes	Speedwell	St. Louis, Mo.	F. A. Nolan	Wilcox
Los Angeles, Cal.	Stewart Auto Sales Co.	Stewart	Toledo, O.	Atwood Automobile Co.	Toledo
Milwaukee, Wis.	Hughes-McDonald Motor Car Co.	Garford			

CUERO, Tex.—J. T. Freeman and associates are arranging to establish a plant for the manufacture of a car device.

Louisville, Ky.—The Breyfogle-Green Co. has moved into its new garage at the southwest corner of Second and A streets.

Fremont, O.—The Safe Storm Shiel Co., of Fremont, has filed papers with the secretary of state increasing its capital stock from \$75,000 to \$100,000.

Akron, O.—Frank Selzer, 116 S. Main street, is having plans drawn for a \$45,000 garage to be constructed in Bowery street. The plans will call for a four-story reinforced concrete building.

Galveston, Tex.—The Galveston Commercial Association is promoting the organization here of a company with a capital stock of \$100,000 for the purpose of erecting a plant for manufacturing motor cars.

New Orleans, La.—T. H. McGiehan has resigned his position of manager of the New Orleans branch of the Goodyear Tire and Rubber Co., to accept the position of general manager of the Motz Tire and Rubber Co., in Akron, O.

Louisville, Ky.—The Southern Motors Co. has acquired a 20-year lease on property owned by the Armstrong estate, in Third avenue just south of Chestnut street, as a step toward carrying out a project to erect a mammoth garage, larger than any

other in the city, costing \$100,000 or more. The new structure will have a total frontage of 138 feet and extend back 200 feet.

Baltimore, Md.—The Church-Field electric is being handled by the Lambert Automobile Co., Maryland and Mt. Royal avenues, Hudson representative.

Columbus, O.—The Bracken Stanton Co. is the name of a new concern which has opened a tire business at Fourth and Gay streets and will handle the Walpole tires.

Yoakum, Tex.—The Yoakum Machine Shops and Garage Co. was recently organized for the purpose of establishing machine shops and garage at Yoakum.

Baltimore, Md.—Quarters have been opened in Baltimore at 308 North Holliday street by the Rholo Tirefiller Co., of which Charles B. Berry and W. N. Glass are in charge.

Winnipeg, Man.—The Manitoba Electric Motor Car Co. has been organized with a capital of \$50,000 to handle the Rauch & Lang line of electric vehicles. The manager of the new concern will be F. H. Girdlestone.

Milwaukee, Wis.—H. P. Ziegler, manager of the Milwaukee branch of the Goodyear company for several years, with headquarters at 134-136 Oneida street, on January 1 was promoted to the position of general manager of the Chicago district of the Goodyear company. The district includes

the principal cities of Chicago, Milwaukee, Omaha, St. Paul, Minneapolis, Des Moines and Sioux City.

New York—Fred J. Titus has been appointed southern representative of the motor car department of the American Locomotive Co.

Boston, Mass.—H. Ross Maddocks, with headquarters at 4 Mystic avenue, Medford, Mass., has been appointed Massachusetts distributor of Stewart trucks. He will secure Boston salesrooms later.

Detroit, Mich.—H. M. Denyes, of the technical department of the Buick Motor Co., at Flint, has gone with the Jackson-Church-Wilcox Co., at Saginaw, as chief engineer.

Baltimore, Md.—The Schacht has made its entry into the Baltimore field. A direct factory branch is located at 2 East North avenue, in the Casino building, which is in charge of I. R. Smith, formerly of Hagerstown, Md.

Milwaukee, Wis.—Orrin R. Hughes, of Marshfield, Wis., state agent for the Garford pleasure and commercial cars, and John McDonald, Jr., who recently resigned as manager of the Kopmeier Motor Car Co., Milwaukee, have joined forces and organized the Hughes-McDonald Motor Car Co., to represent the following lines: Garford, Flanders six, Ohio electric and Garford truck. The company will continue

its principal headquarters on Thirteenth street, between Grand avenue and Wells street, Milwaukee, for the present.

Atlanta, Ga.—The Cartercar has opened a factory branch here. W. C. Mahoney has been made manager of the new branch which is at 242-244 Peachtree street.

St. Louis, Mo.—The Wilcox Trux Sales Co. has been formed in St. Louis to handle the Wilcox. F. A. Nolan is president of the new company which is practically a factory branch.

Pittsburgh, Pa.—The Ley Construction Co., this city, is taking sub-bids on the construction of a \$25,000 fireproof garage in North Highland avenue for William R. Laird. The Pullman Taxicab Co., 210 South Highland avenue, is the lessee.

Columbus, O.—S. W. Schott, local distributor for the Empire and Brush cars, has moved his headquarters from his present location at 602 North Fourth street to more commodious rooms, which he has made arrangements to lease at 237 North Fourth street.

St. Louis, Mo.—The Republic Rubber Co., of Youngstown, O., has leased the building at 2018-20 Locust street, St. Louis, to be used as a branch for the Republic tires. George H. Hoffman will be branch manager. Bart S. Adams, who originally introduced the Republic tires in St. Louis, will continue to handle them at 3408 Lindell avenue.

Des Moines, Ia.—The Herring Motor Co. is moving into a new four-story brick building. One entire floor of the building will be given over to the assembling plant where twenty Ford cars are assembled daily. Another floor will be used by the Herring Motor Supply Co. The Des Moines Motor Co., agent for the White and Studebaker, has taken the old quarters of the Herring company. The Brown-Corley Mo-

tors Co. and C. F. Stewart, district manager for the Flanders, this week moved to the new Masonic temple.

Hartford, Wis.—Lohr & Daniels, South Main street, representatives of the Ford, have completed a large addition to their garage and salesroom building.

St. Louis, Mo.—A company has been formed to manufacture and distribute a motor car heater. It is known as the Bernays-Johnson Fireless Heater Co. The factory and sales offices are located in University City.

Oconto Falls, Wis.—The Oconto Falls Motor Car Co. has taken occupancy of its new garage building, erected at a cost of \$10,000. The garage has a commodious repair shop and storage room. The company represents the Overland and Ford.

Stevens Point, Wis.—The Wisconsin Graphite Co., which owns and mines on more than 200 acres of graphite land in this vicinity, has passed into the sole ownership of E. W. Sells of Stevens point. The company also owns a large water power at McDill.

Newark, O.—The plant, patent rights and all other assets of the C. M. Thompson Co., Newark, O., have been purchased by W. A. Pings, Detroit, Mich. The works will be reorganized, pending which the same officers will remain in charge. The concern manufactures an indestructible hose clamp for motor cars. It is rumored that the plant may be removed to Detroit.

Louisville, Ky.—Following the new policy of the Oldsmobile company to withdraw its wholesale branches in several cities and to handle the wholesale business through its factory at Lansing, Mich., the three-story garage at 728-730 South Fourth avenue has been sold. The consideration, it is understood, was close to \$75,000. Arrangements are now being made to provide

for a local retail agency to handle the Olds line. The property was purchased by G. M. Clark.

Louisville, Ky.—The Yager Motor Car Co., agent for the Hupmobile and Peerless, is erecting a new garage at Third avenue and the L. & N. railroad crossing.

Atlanta, Ga.—The new building being erected by the Buick Motor Co. in Atlanta, Ga., is located at Peachtree and Harris streets. It is of solid concrete fireproof construction, is five stories high and has a total of 26,000 square feet.

Boston, Mass.—Manager R. B. Nettleton, of the Boston branch of the Lozier, has formed a company to handle the car in the Hub capitalized at \$1,000, with himself as president and treasurer and R. S. Barlow and S. G. Barker as directors.

Philadelphia, Pa.—The Baker-Bell Motor Co., local distributor of the Commerce delivery truck, has taken possession of its new quarters, 665-669 North Broad street. Baker and Bell, as managers of the Cartercar Motor Co., also handle the Cartercar.

Mifflintown, Pa.—The Juniata Automobile Co., H. D. Pettit proprietor, is making plans for the erection of a modern garage, showrooms and repair shop building to be 32 by 75 feet, and completed by March 10. The Juniata company will handle the Mitchell in Juniata, Snyder and Mifflin counties. It will handle a line of supplies.

Minneapolis, Minn.—The Studebaker Co. of Minnesota has made a lease for a three-story building to be erected on a site 75 by 154 feet at Fourteenth street and Hennepin avenue. Work will begin on the building at once. The structure will cost about \$75,000. The company now occupies a new building of larger size farther down town of which no disposition has been made yet.

New Orleans, La.—J. A. Landry Motor Car Co., capital stock, \$25,000; directors, J. A. Landry, J. B. Avegno, R. J. Monroes.

New York—United Rubberine Supply Co., capital stock, \$200,000; to deal in tire filler; incorporators, T. H. Royce, C. L. Brookheim.

New York—Wholesale Auto Tire Co.; capital stock, \$1,000; incorporators, W. P. Cole, D. Morris, A. Levy.

New York—General Interboro Auto Express, capital stock, \$3,000; incorporators, G. I. Pound, J. Pallett, P. Pound.

New York—Eureka Auto Dispatch, capital stock, \$1,000; conduct motor car express business; incorporators, R. C. Cuyler, J. C. Stewart, F. T. Lind.

Norfolk, Va.—Michigan Motor Branch of Virginia, capital stock, \$10,000; incorporators, J. T. Buchanan, R. H. Baker, A. M. Bopp.

Philadelphia, Pa.—Cole Motor Co., capital stock, \$5,000; incorporator, E. L. Beatty.

Pittsburgh, Pa.—Union Top Mfg. Co., capital stock, \$25,000; to make motor cars; incorporators, J. R. Young, J. Millholland, L. C. Shreve.

Portland, Me.—Portland Automobile Dealers' Association, capital stock, \$10,000; incorporators, F. A. Nickerson, E. F. Brewer, L. C. Gilson.

San Antonio, Tex.—Motor Car Supply Co., capital stock, \$5,000; incorporators, C. P. Guthrie, H. B. Lyne, J. Harrison, W. Harrison.

South Bend, Ind.—Cadillac Motor Sales Co., capital stock, \$10,000; incorporators, N. L. Otis, G. H. Grieger, E. W. Steinhart.

Springfield, Ill.—Broadway Auto Sales Co., capital stock, \$2,500; incorporators, A. Thompson, J. G. Stuart, J. G. Clough.

Recent Incorporations

St. Louis, Mo.—J. T. Moss Motor Car Co., capital stock, \$10,000; incorporators, T. J. Moss, J. W. Fristoe, E. J. Dykstra.

St. Johnsville, N. Y.—B & C Auto Co., capital stock, \$3,000; incorporators, G. F. Bierman, S. V. Christman, C. A. Bierman.

Wheeling, W. Va.—Bridgeport Auto Co., capital stock, \$5,000; to manufacture motor cars; incorporators, J. B. Handlan, W. G. Hamilton, G. T. Knote, E. Morrell, H. Miller.

Williamson, N. Y.—Williamson Garage Co., capital stock, \$20,000; incorporators, R. S. Carr, C. I. Dezutter, A. F. Raynor.

Worcester, Mass.—Maykel Automobile Co., capital stock, \$12,500; directors, M. K. Maykel, M. L. Katz, A. Massad.

Baltimore, Md.—Maryland Motor Car Insurance Co., capital stock, \$300,000; incorporators, J. C. Fenhagen, W. Whitridge, W. G. Bowdoin, J. P. Bonsal.

Boston, Mass.—Lozier Motor Co. of New England, capital stock, \$1,000; directors, R. B. Nettleton, R. S. Barlow, S. G. Barker.

Boston, Mass.—Norwalk Motor Car Co., capital stock, \$75,000; directors, C. W. Smith, J. W. Briggs, M. A. Beaudet.

Canton, O.—Original Punctureproof Co., capital stock, \$50,000; to deal in motor car accessories; incorporators, W. E. Steinmetz, E. D. Myers, E. L. Hang, W. Worley, R. E. Mitzel.

Chicago—Aldine Auto Livery Co., capital stock, \$2,500; to conduct motor car livery; incorporators, C. A. Dickinson, A. B. Lapham, W. R. Scates.

Chicago—Marmon Chicago Co., capital stock, \$20,000; general motor car business; incorporators, M. E. Horn, C. E. Erbstein, E. J. Ehlers.

Columbia, Ky.—Columbia Motor Freight Co., capital stock, \$3,000; incorporators, R. H. Durham, W. R. Myers, E. B. Barger.

Detroit, Mich.—Detroit Armature & Motor Works, capital stock, \$10,000; incorporators, W. J. Harting, J. S. Keightley, M. E. Reynolds.

Detroit, Mich.—Armitage Leather Co., capital stock, \$35,000; to manufacture leather for motor cars; incorporators, E. Armitage, W. S. Gurd, R. B. Gillespie.

Fall River, Mass.—Frank C. Silvia Co., capital stock, \$5,000; general motor car business; directors, H. E. Clarkin, F. C. Silvia, F. Amber.

Harrisburg, Pa.—Morton Truck & Tractor Co., capital stock, \$1,000; incorporators, J. Campbell and others.

Jamestown, N. Y.—Eagle Garage Co., capital stock, \$25,000; incorporators, S. B. Robbins, O. M. Spencer, G. Rappole.

Kansas City, Mo.—Hanna Motor Mfg. Co., capital stock, \$60,000; incorporators, John M. Hanna, F. A. Hanna and others.

Louisville, Ky.—Miller-White & Co., capital stock, \$5,000; to deal in motor cars; incorporators, R. W. Miller, A. W. White, W. Atix.

Morristown, N. J.—Morristown Auto Co., capital stock, \$25,000; incorporators, J. J. Lyons, L. Van Gasbeek, A. Newark.

Muskogee, Okla.—Pioneer Motor Co., capital stock, \$5,000; incorporators, G. S. Waddell, H. G. Butts, M. L. Waddell.



CAT
DOG
MOTOR
PLUG

The Motorist's Kindergarten



EDITOR'S NOTE—Motor Age is publishing in this department a series of non-technical explanations of the various parts of motor cars for the benefit of the reader who knows nothing about them. The subjects will be dealt with in the most elementary manner, so that the series when completed will form a simple elucidation of the car. The first article appeared October 10, 1912.

It is evident that the electric cell described last week is totally unfit for use in motor cars unless covered, because the liquid would be slopping and spilling out. However, this same type of cell is often used for motor cars, but to prevent the liquid from spilling, the container is covered. A more common and handy way is to use what is known as a dry cell. In this type the copper of the wet cell is replaced by a carbon rod and the sulphuric acid used as the electrolyte in the wet cell is supplanted by sal ammoniac and other chemicals. The zinc, instead of being a stick or plate as in the cell described last week, is in the case of the dry cell a can. This can acts as the container as well as the negative electrode.

When the term dry cell is used, one must not get the idea that the contents of the cell are perfectly dry, for such is not the case. The dry cell to be distinguished from the wet cell or simple cell described last week, may be defined as a cell whose contents may not be spilled.

Fig. 21 shows how a dry cell would look if split down the middle and the illustration shows the arrangement of the different parts. The dry cell shown in the figure is an example of the commercial cell, or as it is sometimes called dry battery and is typical of this form of electricity producing agent. The common dry cell is a cylindrical can made of zinc, the inner wall of which is padded with ordinary blotting paper soaked with water. The part of the cell marked A in the figure is called the filling or electrolyte. It is composed of a number of chemical compounds, among which will be found the depolarizer. In the case of the wet cell the depolarizer was a carbon pipe placed around the positive electrode, but in the case of the dry cell the depolarizer is part of the electrolyte itself. The filling is a pasty mass made so by its mixture with water. In the middle of the electrolyte or filling is a stick of carbon or charcoal. It is not customary to use ordinary charcoal, but instead a fine grade is used similar to that employed for electric arc lamps. The stick of carbon in the cell goes about two-thirds of the distance into the can and touches nothing but the electrolyte and the tar which is placed above the electrolyte to prevent evaporation of the water. When the cell is first bought, there is a cardboard cover around the zinc cup. The reason for this will be given later.

No chemical action will take place between two substances that are perfectly

The Common Dry Cell

dry. In the case of the dry cell the action is started and continued by the use of water. The electrolyte itself is mixed with water before it is placed in the zinc can, but this is soon used up, so to supplant the deficiency the blotting paper which completely surrounds the electrolyte is soaked with water.

The electrolyte, as has been stated, is composed of a number of chemicals the nature of which vary with the different makes of dry cells. However, the result of the chemical action within the cell is the same in all cases. The filling or electrolyte usually consists of chloride of zinc, chloride of ammonia, or, as it is more often called, sal ammoniac, sulphate of lime and powdered charcoal. Of course all of these chemicals are not used in every make of cell, for some manufacturers use peroxide of manganese instead of the pow-

dered charcoal, while others do not use any sulphate of lime. Then again different makers use these chemicals in different proportions. Sal ammoniac is in every case the main constituent of the cell.

Just as the wet cell had a carbon pipe or cup as a depolarizer so the dry cell too uses carbon but in the form of a powder. It is far easier to grind some charcoal and mix it with the electrolyte than it is to insert a pipe. The reason carbon or charcoal is used is because it has a great capacity for absorbing gases, and that is just what a good depolarizer does—absorbs gases. All the chemicals put into the cell are previously mixed with water to form a pasty mass. This paste is packed around the carbon stick. All around the electrolyte is the water-soaked blotting paper. Molten tar is poured on top of the electrolyte, and allowed to harden. The tar prevents any of the water from evaporating, for should this occur the action within the cell would stop. The carbon stick has attached to its upper end a screw and nut so that a wire may be fastened to it conveniently. The zinc cup too has such a contrivance and this is well brought out in the illustration.

The compounds, sometimes called the exciting mass, contained in the zinc can act chemically upon one another and also with the zinc container. This chemical action in the presence of the carbon produces electricity which travels from the zinc to the carbon, through the carbon stick to the outside circuit, which in the case of the motor car is usually the spark coil, but may be an electric lamp or horn.

The carbon electrode never wears out and although the zinc does wear under ordinary conditions and use, this wear is rarely considered. The battery will give out if constantly in use long before the zinc shows signs of wear, because the water evaporates or the electrolyte is used up.

The cardboard case is placed around the zinc to prevent short circuiting; that is, to prevent the zinc of one cell from touching the zinc of another when a number are connected. Should the zinc of one touch that of another it would hinder the flow of electricity to the outside circuit.

Dry cells are practical for motor car ignition only when used in intermittent service, starting the engine, for example. They are best suited as a source of current for electric horns because the horn is not used continually. The continual use of a dry cell shortens its life.

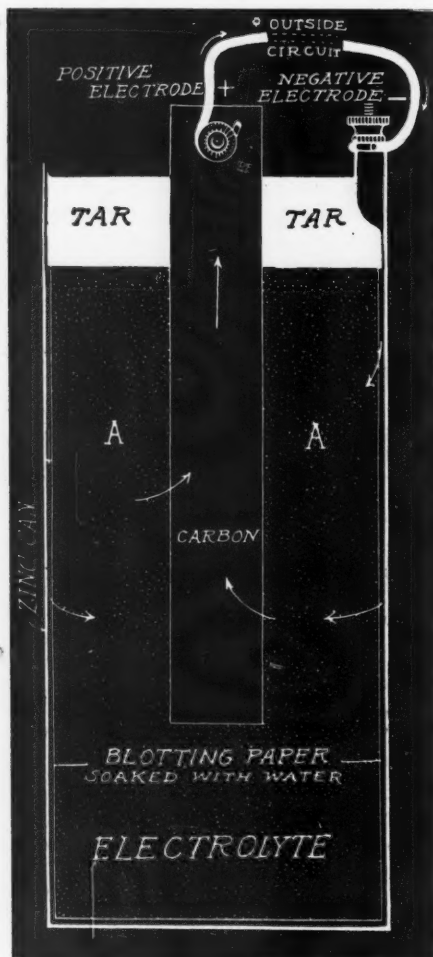
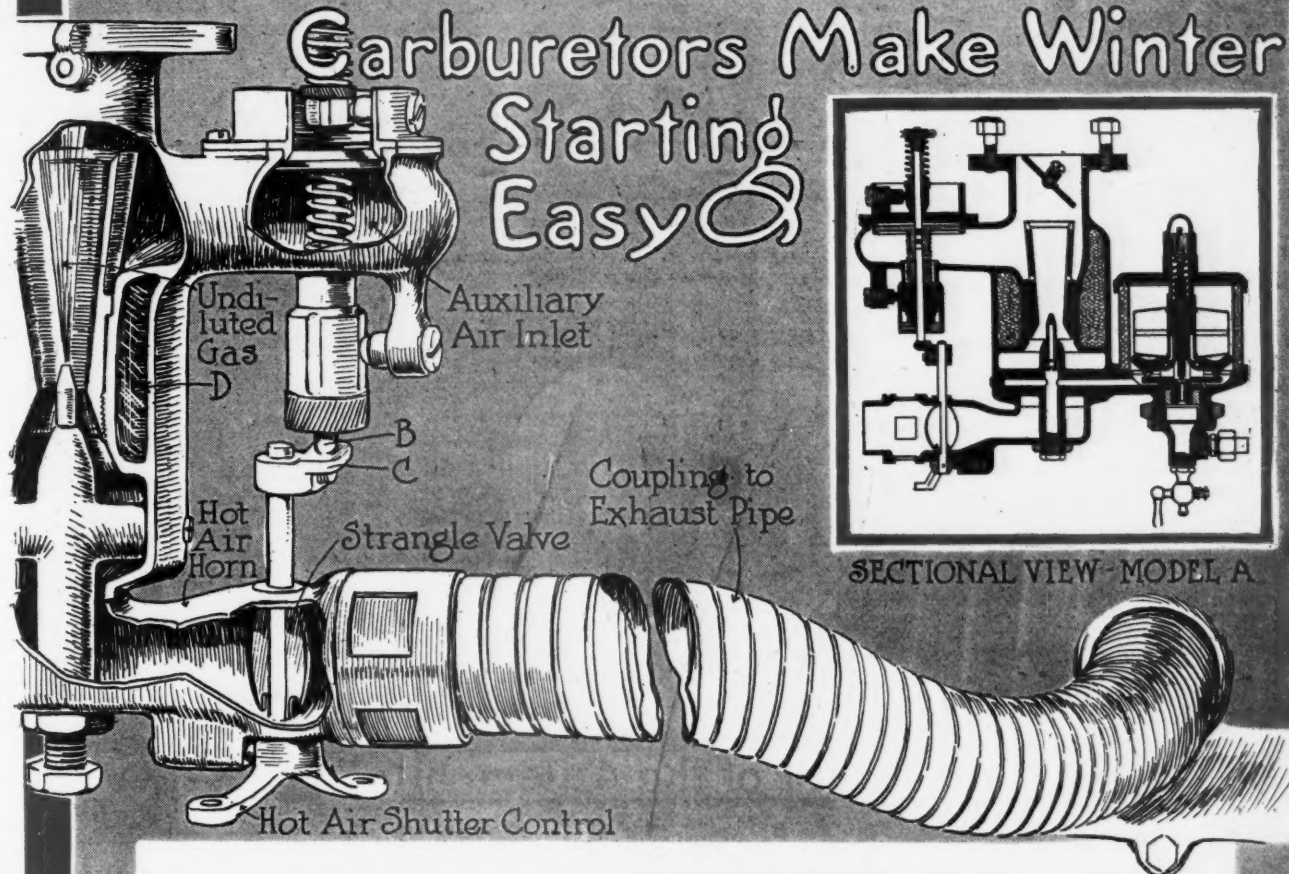


FIG. 21—INTERIOR OF A DRY CELL

WHY STROMBERG

Carburetors Make Winter Starting Easy



The motor that can't start in cold weather without being teased with the aid of priming cups indicates a carburetor that was stopped in construction just this side of perfection.

STROMBERG Improved Carburetors make winter starting easy only because they were expressly designed to.

STROMBERG Improved Carburetors make winter starting easy because of their combination hot air horn and starting device (see diagram). **STROMBERG Improved Carburetors** prime their own motors—save you the trouble. For cold weather starting, close the strangle valve (A). This closes the regular air at the same time it chokes the auxiliary air by locking the stem (B) at (C). The vacuum created results in pure, undiluted gas being sucked up into the manifold and motor. This super-rich mixture ignites with the first spark. The strangle valve is now opened.

The first explosion heats the exhaust pipe, whence hot air is drawn to the carburetor through the hot air horn, on the second and all succeeding intake strokes.

The hot air, of course, makes for "hurry up" vaporization of the gasoline, which is the only cure known for a stubborn winter motor. The hot water jacket (D) is a further aid to ready vaporization. Hot water being the last thing to cool, and the exhaust pipe the first thing to heat, the carburetor at all times, on the start and on the pick up, operates in coldest weather as though under the most favorable summer conditions.

These are "Reasons Why" **STROMBERG Improved Carburetors** make winter starting easy. Next week will appear "REASONS WHY STROMBERG IMPROVED CARBURETORS GIVE GREATEST ACCELERATION WITHOUT LOSS IN ECONOMY." Your address on the back of a postal will bring you all "Reason Why" talks issued to date.

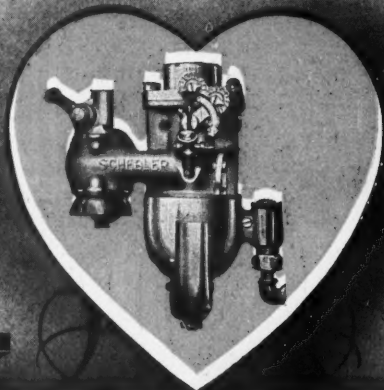
Reason Why Talk—2

Look for our exhibit at the New York Show (Madison Square Garden, Balcony space 210), and at Chicago

Stromberg Motor Devices Company, 100 East 25th St., Chicago, Ill.
Branches: New York Boston San Francisco Indianapolis Minneapolis Detroit

SCHIEBLER

*The Aristocrat
of Carburetors*



"The Heart of the Automobile"

WHEELER & SCHIEBLER

"Pioneers in Perfection" of Carburetion
MANUFACTURERS
INDIANAPOLIS U.S.A.

THE SCHIEBLER IS THE ACKNOWLEDGED
STANDARD CARBURETOR OF THE WORLD

Branches

NEW YORK
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SEATTLE
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SIDNEY AUSTRALIA

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Distributors

Every city and town in
the United States and
Canada • Europe and
• Australia •

FORTY-EIGHT

DIFFERENT MAKES OF CARS ARE NOW KLAXON-EQUIPPED

An Editorial from MOTOR WORLD:—

*As Regular
Equipment:*

A. E. C.
Alco
Armleder
Autocar
Babcock Electric
Roadster
H. H. Babcock
Bailey
Benz
Borland Electric
Broc Electric
Charon *
Columbia
Chicago Electric
Davis
F.I.A.T.
Flanders
King
Knickerbocker
Knox
Lancia *
Lozier
Marmon
Matheson
Metallurgique

ACCESSORIES THAT ASSIST CAR SALES.

Although the time never may come when the accessories that constitute the equipment of a car will of themselves sell cars, the fact remains that the item of equipment now is being made so much of, that he who does not turn it to advantage is permitting good "ammunition" to go to waste.

In many cases, the names of many of the devices which go to make up the equipment list are better known than the names of the cars themselves. Nor is it difficult to understand why a particular accessory should have become better known than the name of the car upon which it is mounted. The manufacturer of the device has widely advertised it and built up a reputation, and because it is a good device the manufacturer of the car and the dealer also advertise it—if they are wise—for they realize that in linking the name of a well-known and well-tried product with the name of their car a certain prestige thereby is added to the car. The automobile buying public has come to know that certain accessories have made names for themselves and it is but a step further to attach real importance to a car that carries one or more meritorious devices.

Horns and lamps and electric lighting systems and starters and a hundred and one other items of equipment which not so very long ago were listed as "extras"—all these serve as cases in point.

With but one or two exceptions—this list includes every high-grade car.

Michigan
Electric
Multiplex
Nance
National
Oakland
Oldsmobile
Orson
Pope Hartford
Pierce-Arrow
Pratt
Schneider *
Simplex
Staver
Stearns
Sternberg
Stevens-Duryea
Stoddard-Dayton
Guy Vaughn
Walker Electric
Ward
White

As Special Equipment:

Cole
Hudson
Packard

* European Equipment

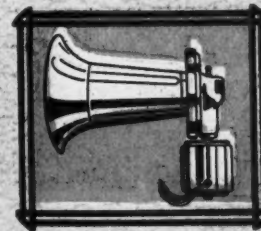


KLAXONET

Lovell-McConnell Mfg Company Newark, N.J., U.S.A.

KLAXON

"The Public Safety Signal"



KLAXON

**STOCK
CHAMPION**



National

**INTERNATIONAL
CHAMPION**



Money Cannot Buy Better Materials Nor More Elegant and Completely Equipped Car

Long stroke ($4\frac{7}{8}$ x 6) flexible and noiseless Motor with enclosed valves.

Left Side Drive.

Center Control.

Gray & Davis Electric Starter, easily operated by simply touching a button with foot.

Gray & Davis Dynamo Electric Lighting System.

Bosch dual double Magneto.

12-inch Turkish Upholstery.

Full heavy nickel Trimmings.

Electric Horn.

Adequate Baggage-carrying Compartment concealed in body but easily accessible.

Powerful and reliable Brakes.

Spacious Interior.

Tire Pump, integral part of the motor. Inflates a tire in three minutes.

Truffault-Hartford Shock Absorbers on rear.

128-inch Wheel Base.

Gray & Davis 12-inch black and nickel bullet head lights.

Adjustable, ventilating and rain vision Wind Shield.

Multiple jet Carburetor.

Hoffecker steady-hand Speedometer.

Tire Carrier in rear.

Silk mohair Top, Cover and Curtains.

Full-floating Rear Axle.

Resilient Springs, $\frac{3}{4}$ Elliptic in rear; Semi-Elliptic in front.

Large gasoline pressure-feed Tank with Gauge in rear.

Robe Rail and Foot Rest.

Foot Mat in Running Board.

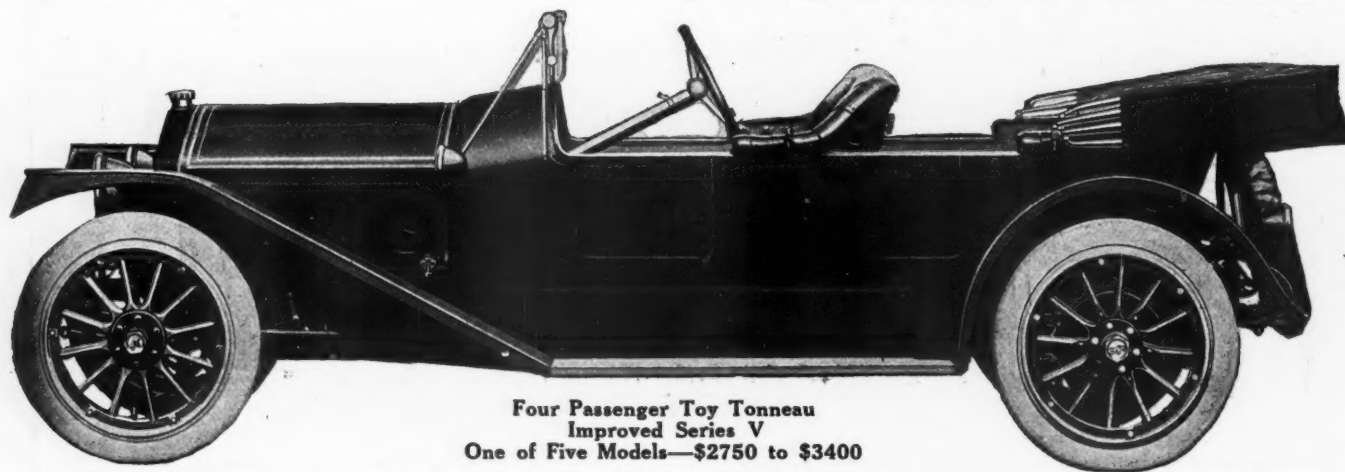
Plain, continuous enclosed Metal Guards.

Easy riding qualities, unexcelled.

Oiling System, demonstrated to be only perfect oiling system.

Tools and jack in box concealed by splash on running board.

One extra Firestone demountable rim.



Four Passenger Toy Tonneau
Improved Series V
One of Five Models—\$2750 to \$3400

NATIONAL MOTOR VEHICLE COMPANY, Indianapolis, Ind.

When Writing to Advertisers, Please Mention Motor Age



This Is the Way You Look Cranking a Car by Hand

Dignified position, isn't it?

You would look far more dignified and be better satisfied with yourself and your car if you sat in your seat and allowed an Electric Self Cranker to do the work for you.

The Storage Battery is the heart of Electric Cranking and Lighting Systems.

Be sure yours has an



STORAGE BATTERY

Use Class A **GLBA** Battery with an Electric Lighting Generator

Use Class B **GLBA** Battery with an Electric Self-Starter

Write us for full information

Willard Storage Battery Co.
CLEVELAND, OHIO

New York Branch: 136 W. 52d St.
Detroit Branch: 1191 Woodward Ave.

Chicago Branch: 2241 Michigan Ave.
San Francisco Branch: 243 Monadnock Bldg.

Depots in all Principal Cities in the United States, Canada and Mexico

A Great Car At the Big Shows

Plan to spend a good share of your time at the New York Show or the Chicago Show witnessing the special demonstration of the Dreadnought Moline M-40 five passenger touring car and two passenger roadster. When you are thoroughly informed as to these superb cars—see everything else and make comparisons. Make our booth your headquarters. Look for the

Dreadnought Moline M-40

Electric Self-Starter---Electric Lights

Completely Equipped, \$1,950

At the New York Automobile Show, Madison Square Garden, January 11 to 18, 1913
At the Chicago Automobile Show, Coliseum, February 1 to 8, 1913

This famous car holds unapproached world's reliability records. Won in the classic Chicago Reliability Run 1910, 1911 and 1912. A superb car. A car with a pedigree. A car you will be proud to ride in, and happy to drive. Its owners place every confidence in the ample power of the famous Dreadnought Moline Long Stroke Motor—its passengers enjoy the highest degree of luxury and convenience. Sturdy and reliable over the roughest country going, its flexibility makes it ideal for crowded city traffic. It has power and endurance for touring—beauty and style for the boulevards. In every sense of the word—a superb car.

On its 124 inches of wheel base rests as great car value as you will find in America. To prove to yourself this statement we ask you to read the following list of

Over a Score of Added Features

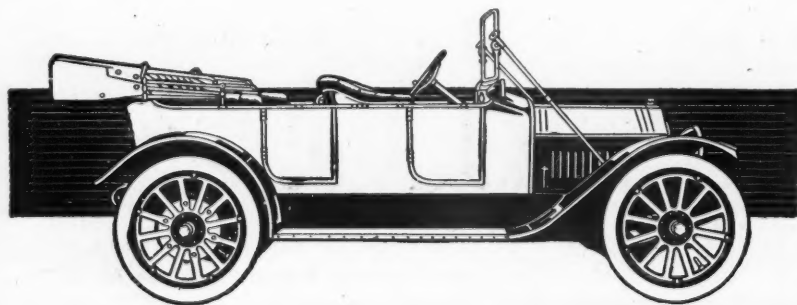
10 inches added wheel base (now 124 inches)
Electric Self-Starter and Electric Lighting System
5 more horsepower
Improved Steering Gear
Gasoline tank under cowl—Indicator and filler on dash

Inside control
Ten inch upholstery
Turkish spring cushions
Flush side bodies
Nickel trimmings
Long stroke motor, 40 H. P.
Enlarged brakes
Improved springs
Large wheels and tires

Exceptionally roomy body
Demountable rims (set of 5)
Double independent ignition system
Carburetor dash air control
Rain vision wind shield
Moline silk mohair top
Speedometer
Completely equipped

We invite the closest scrutiny—the most careful comparison of values. Winning every Reliability event entered in 1911 and 1912, the Dreadnought Moline with its Long Stroke Motor, is rightly considered "One of the Most Reliable Cars in America." See the car itself at the New York Show, Jan. 11 to 25, 1913; or the Chicago Show, Feb. 1 to 15, 1913.

We have some live and interested territory for high-class, progressive dealers only. If you can qualify, write us on your business stationery. We will reply personally and confidentially. Handsomely printed informative literature on request.



**Moline Automobile
Company**

101 Keokuk St., East Moline, Ill.

? WHICH

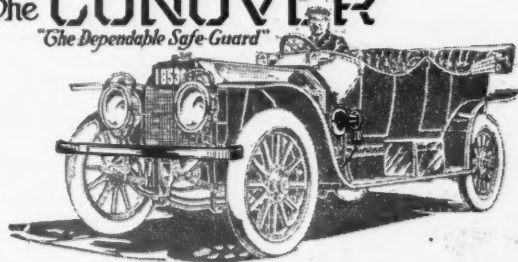
FOR EVERY CAR OWNER the question gets right down to this alternative: *damage* or a *Conover Safe-Guard*.

EITHER is inevitable.

COLLISION you *cannot* avoid. If you don't run into something, some other car or wagon backs into you. It is merely a matter of time for *every* car. Fenders, lamps, radiator, wheels, axle—any or all will be smashed to some extent. If badly, you can collect insurance; but you lose the use of your car while repairs are being made. If slightly damaged, you cannot collect a dollar.

The CONOVER

"The Dependable Safe-Guard"



PROTECTION you *can* have. And this for the original price of *one* Conover. Made on a new principle; backed by a new guarantee. Its broad, flat surface, sturdy semi-elliptic steel springs, with four contact points, were made to take blows. If dented, you can hammer back the protection surface. If broken, you can have a new Conover *free*, any time within two years.

WHICH alternative? Which is the economical, satisfactory sensible one?

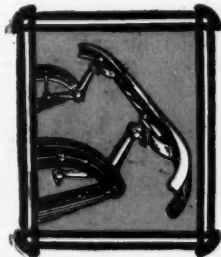
Best quality of steel **\$15.00**
heavily enameled in
black, royal blue, French
gray or maroon; bar 2 inches wide.
(Any other color of enamel \$5.00 extra)

Best quality of steel, **\$17.50**
brass or nickel plated;
bar 2 in. wide

Solid bronze, finished in **\$25.00**
either brass or nickel;
bar 2 in. or 2½ in. wide

Shipped, express paid, anywhere in the United States, on thirty day's trial, upon receipt of the regular price. When ordering, give name and model of car. Specify size and finish desired.

An attractive booklet will be sent free upon request.

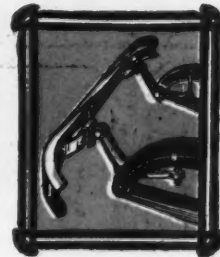


LOVELL-McCONNELL MFG. COMPANY
Sellers in Newark, N. J.

NEW JERSEY TUBE COMPANY
Makers in Newark, N. J.

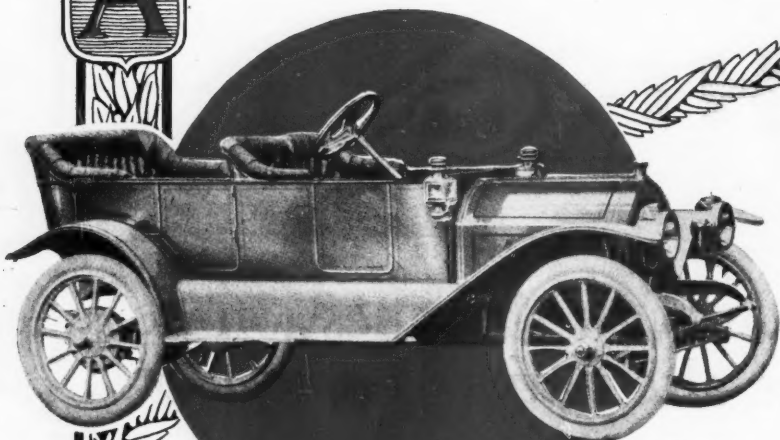
CONOVER

"The Dependable Safe-Guard"



The Big Auburn

"Rides Like a Pullman"



5 Chassis

Every Car a Distinct Masterpiece

EVERY AUBURN model expresses the peak-load of value at its price. Model 33-L at \$1,250, on down to Model 6-50 at \$3,000, have crammed into them all the value their prices will bear.

By shaving and paring we could market the same car at a greater profit to ourselves—but here's the point—at a less profit to the purchaser. Ten years ago we came to the conclusion that no motor-

ist would buy a **poor** car twice—that to become a driving and "going" concern we had to deliver not **fair** value but **utmost** value. Our policy became not primarily to achieve the dollar but to confer a benefit—to impress every owner of an AUBURN that we had not sold him our car to get his money, but that he had paid his money to get our car.

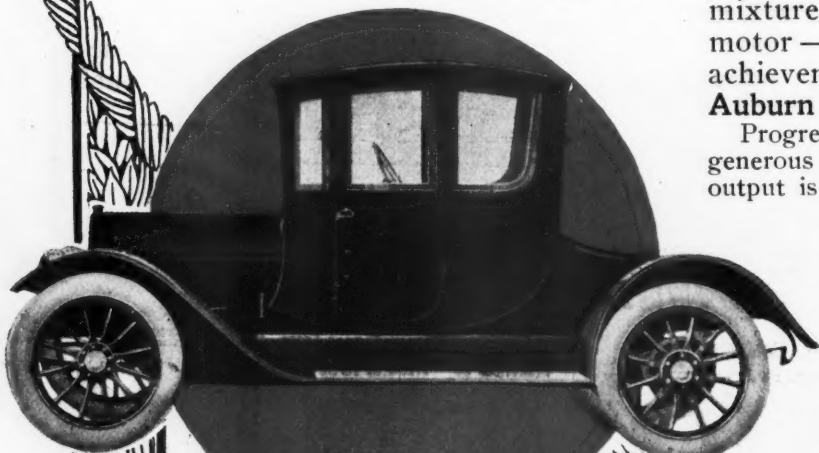
That policy rigidly held to has given rise to the catch-phrase, recognized motor-dom over, "Varnish, upholstery and hood on an AUBURN conceal nothing but Quality."

Here's the kernel for dealers—motor-wise purchasers "come to" the AUBURN, prejudiced in its favor. Neither scientific salesmanship, with its strategies, nor the 90-h.p. talk-fest are called upon to convince prudent buyers. They **know** that rich-

mixture sales-talk won't make a sweet-running motor—that what a car does is the only achievement. **Ten years' performance makes Auburn Cars self-sellers.**

Progressive dealers cannot afford to overlook our generous agency proposition. Although our 1913 output is dangerously near to being oversold, a certain allotment of cars is being held subject to the option of new dealers. Write or wire us at once.

This superb line can be seen in Madison Square Garden, New York Show, January 11-18; the Coliseum at Chicago Show, February 1-8, and Montreal, Canada Show, January 4-11.



MODEL 6-45

Coupe, 2-Passenger; motor, 3½ x 5½; 130" wheel-base; selective transmission; Remy magneto; full floating axle; 36 x 4" tires; demountable rims; equipped with electric generator, starter, speedometer, etc. Price—\$2600.

The Auburn
Auburn,

Line for 1913

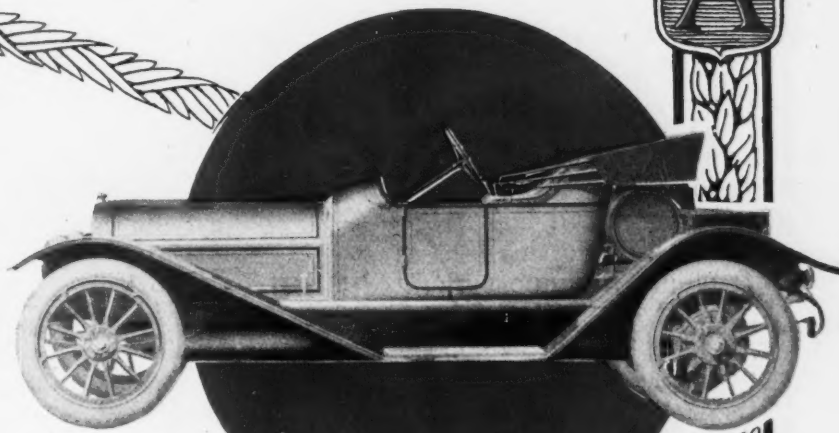
Pulls Like a Locomotive"

6 Body Designs

What It Means to Sell Every Prospect

IN this day of moderate price cars, four out of five sales fall within the two extremes—\$1,250 and \$3,000. The "one car" dealer can sell to those prospects only who fall within his "price class." Men looking for a lower price car or one not so low, sift past him.

The AUBURN dealer who handles a complete line—who has a car which fits every buyer's requirements in service, price and appearance—is limited in sales only by the number of people in his territory on the market for quality cars. His business is extensive rather than intensive—he can sell the "great many" rather than only the "limited few." Therein lies success!



MODEL 6-45 B

2-passenger Roadster; motor, 3 3/4 x 5 1/4; 130" wheel-base; full floating axle; inside control; demountable rims; equipped with electric lamps and generator, starter, speedometer, top and windshield. Price—\$2150.

Complete Auburn Line for 1913

Model 33-L Touring Car or Roadster, complete at \$1250, flatters the judgment of those who desire maximum car efficiency joined with minimum cost.

Model 6-45 Touring Car or Roadster, complete at \$2150, bears every mark of master-building and possesses all the tried principles of AUBURN car construction. Magnificently equipped.

Model 37-L Touring Car or Roadster at \$1525 possesses a more powerful motor, a longer wheel-base and a few other refinements over Model 33-L. An ideal family car.

Model 6-50, 7-passenger Touring Car, complete at \$3000, is the AUBURN ideal of "quality car" construction brought to its fullest perfection. Long wheel-base, full floating rear axle, electric generated lighting system, etc., etc.

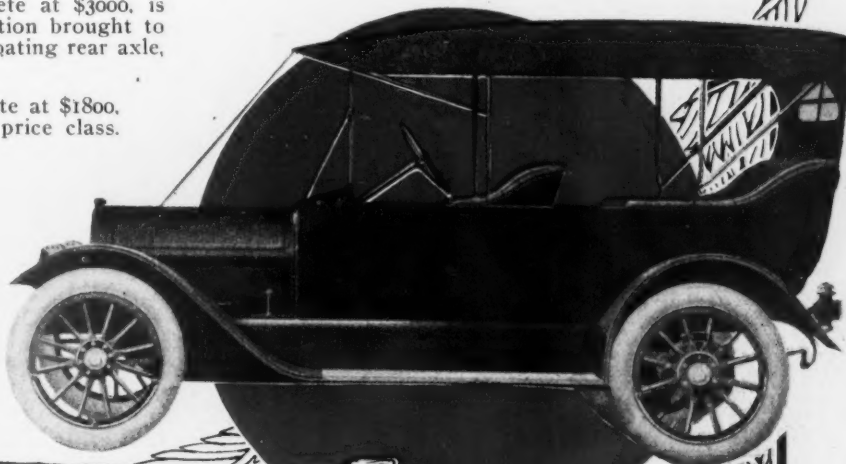
Model 40-L Touring Car or Roadster, complete at \$1800, sets the standard of automobile value in its price class. Model 40-L Town Car, \$2500.

Models 40-L and 6-45 can be supplied at an additional cost with coupe, limousine or sedan bodies.

We are prepared to install electric generators and electric or compressed air starters at a small additional cost.

Write for handsomely illustrated catalog containing specifications in full

Automobile Co.
Indiana



MODEL 6-45

5-passenger Touring Car; motor, 3 3/4 x 5 1/4; 130" wheel-base; full floating axle; inside control; demountable rims; equipped with electric lamps and generator, starter, speedometer, top and windshield. Price—\$1250.

The Evolution of the Delco System

The Revolution of the Automobile

A YEAR AGO one car was shown at the New York Automobile Show, equipped with a practical electric self-starting system—

One manufacturer, with the courage of his convictions back of him, boldly announced that the 12,000 cars to be produced by his factory would be equipped with an electric self-cranking and lighting system known as the Delco.

That was just a year ago.

This year almost every car that is exhibited at the Automobile Show will be equipped with some form of electric self-starter.

In one year the Delco System has overcome criticism, demonstrated its reliability and efficiency, and has not only established itself but has made compulsory the use of some form of electrical self-starter on practically every automobile built.

It would be impossible, of course, for all of these cars to be equipped with the Delco System. Great as has been the development in manufacturing facilities during this last year, it is not equal to so gigantic a task as that.

Seven of America's leading cars will be found at this year's shows, however, exhibiting the Delco System as part of their regular equipment.

And the total output of Delco Equipped Cars for 1913 will be in excess of 45,000. History has been made rapidly in the electric self-starter business.

The Delco System

Electric Cranking-Lighting-Ignition

Three important things have contributed to the extraordinary success of the Delco System.

First: A fundamental idea.

Second: An engineering department for the proper development and application of the idea.

Third: Capital and equipment to carry on the manufacturing in a proper way.

Each of these essentials, of course, has had to have a solid foundation in order to produce the results that have been accomplished.

Almost every one who has studied the electric self-starting problem appreciates the soundness of the fundamental idea upon which the Delco System is based.

Only those who have actually lived at the Delco factory can appreciate the engineering perseverance and skill that have been necessary in working out the commercial application of this idea to the peculiar requirements of each of the various cars to which it has been applied.

And only those who have seen and inspected the great factory that has been erected at Dayton, and the almost equally large one at Chicago, with their wonderful, automatic machinery and their hundreds of trained workmen, can appreciate the capital and equipment necessary to supply the insistent demand that has already developed for Delco apparatus.

The factory at Dayton has almost six acres of floor space, devoted exclusively to the manufacture of Delco Equipment. It is provided with the most modern machinery that money can buy, and is manned by the best mechanics that can be found.

Millions of dollars of capital are back of the enterprise.

And the purpose and aim of it all is just one thing—the manufacture of the best electric starting, lighting and ignition apparatus that engineering and mechanical ability can produce.

The Delco System is simple in construction, light in weight, powerful and positive in operation.

It cranks the engine in a perfectly normal way, by applying the power externally just as you would with a hand crank.

It continues the cranking process persistently, until the engine starts on its own power.

It cannot fail to start the car unless the engine itself is out of order.

The Delco System is self-maintaining.

The ordinary operation of the car automatically charges the storage battery, and insures a uniform and always ready supply of current for ignition, for lighting purposes and for starting.

It is a made-to-order system. Built especially in each instance to meet the requirements of the cars for which it is furnished.

It is built into the car, becomes an integral part of it, and works in perfect harmony with every other part.

That is why the Delco System is not exactly the same on any two makes of cars.

And yet, in each instance, the Delco System is the most perfect that engineering skill can produce for the particular car of which it is to become a part.

You will find Delco Equipment exhibited at the shows on the 1913 models of the following cars:

The Cadillac, The Hudson, The Packard, The Cole, The Oldsmobile, The Oakland, The Jackson.

We have a book describing the Delco System and its operations that we will be glad to send you upon request.

The Dayton Engineering Laboratories Co., Dayton, Ohio





The HAVERS "Six" AT THE New York Show.



Of course you have read our announcement "that was withheld for three years" in this week's Saturday Evening Post. It told you what we have been doing in the past three years,—what we are going to do in the future. It also told you that we will be at the New York Show.

It is the first of a series of advertisements to appear in the Post and other periodicals and newspapers. For we want to drive home to the public the fact that this is the year of the Six and the Havers the Six of the year.

**We are going to exhibit our entire line of Havers Sixes at the New York Show, January 11 to 18.
We will be on the mezzanine floor, Space 127.**

GRAND CENTRAL PALACE.

You are cordially invited to inspect these cars.

Whether you represent a Six or not, we want you to make a careful, thorough investigation of both the finished car and the open chassis, for the Havers Six will stand comparison with the most expensive automobile manufactured.

Beautiful in line, perfect in action, exquisite in appointment, it compels your first consideration. For a thousand dollars less than you expect, it gives you everything that can

be asked in Six-cylinder luxury and service. **Come and make us prove it.**

To the worth-while dealer who does not represent a Six, we extend a special invitation which may prove mutually profitable.

We have greatly increased our production by the purchase of the large E-M-F plant at Port Huron and in certain territory where we are not represented we have an attractive proposition. If you are not going to New York write us today for particulars.

\$2250

Havers Motor Car Co.

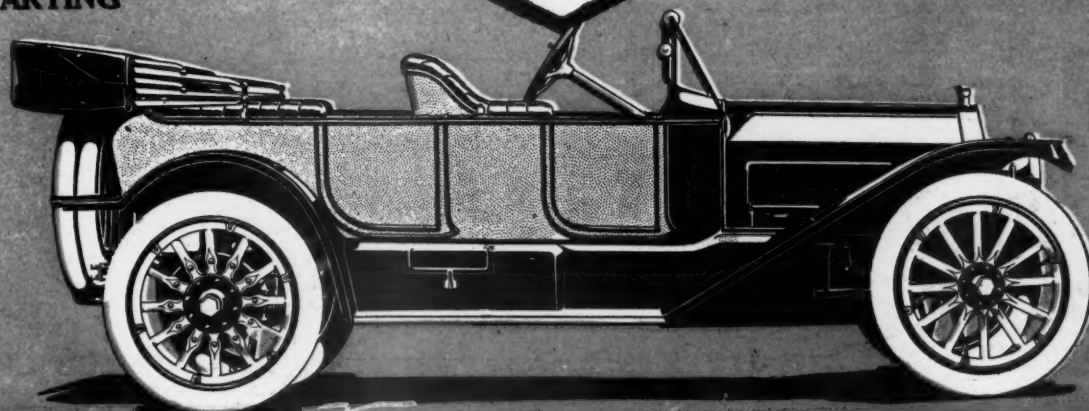
1501 Pine Avenue

Port Huron,
Mich.

\$1850

**HAVERS
"SIX 55"
ELECTRIC
LIGHTING
STARTING**

**HAVERS
"SIX 44"
WITH
STANDARD
EQUIPMENT**



When Writing to Advertisers, Please Mention Motor Age.

KLINE KAR

THE value of an automobile both to owners and dealers lies not in the reputation of its makers, but in the real merit of the car itself. This is just the reason why the KLINE KAR means satisfaction to the user and tremendous financial return for the dealer. No greater combination of beauty, efficiency and durability has ever been turned out of any factory.

We have thousands of testimonials from satisfied users proving conclusively that KLINE KARS are built to satisfy and to stand up.

KLINE KARS have features of construction which positively stamp them as being ahead of their time. The economical transmission installed in all our models is one of the wonders of automobile engineering. It gives direct drive on third speed and means a tremendous saving of power. In addition to this, everyone of the models is equipped with enclosed valves, a complete electric lighting outfit, auxiliary rear springs, and an automatic mechanical starter.

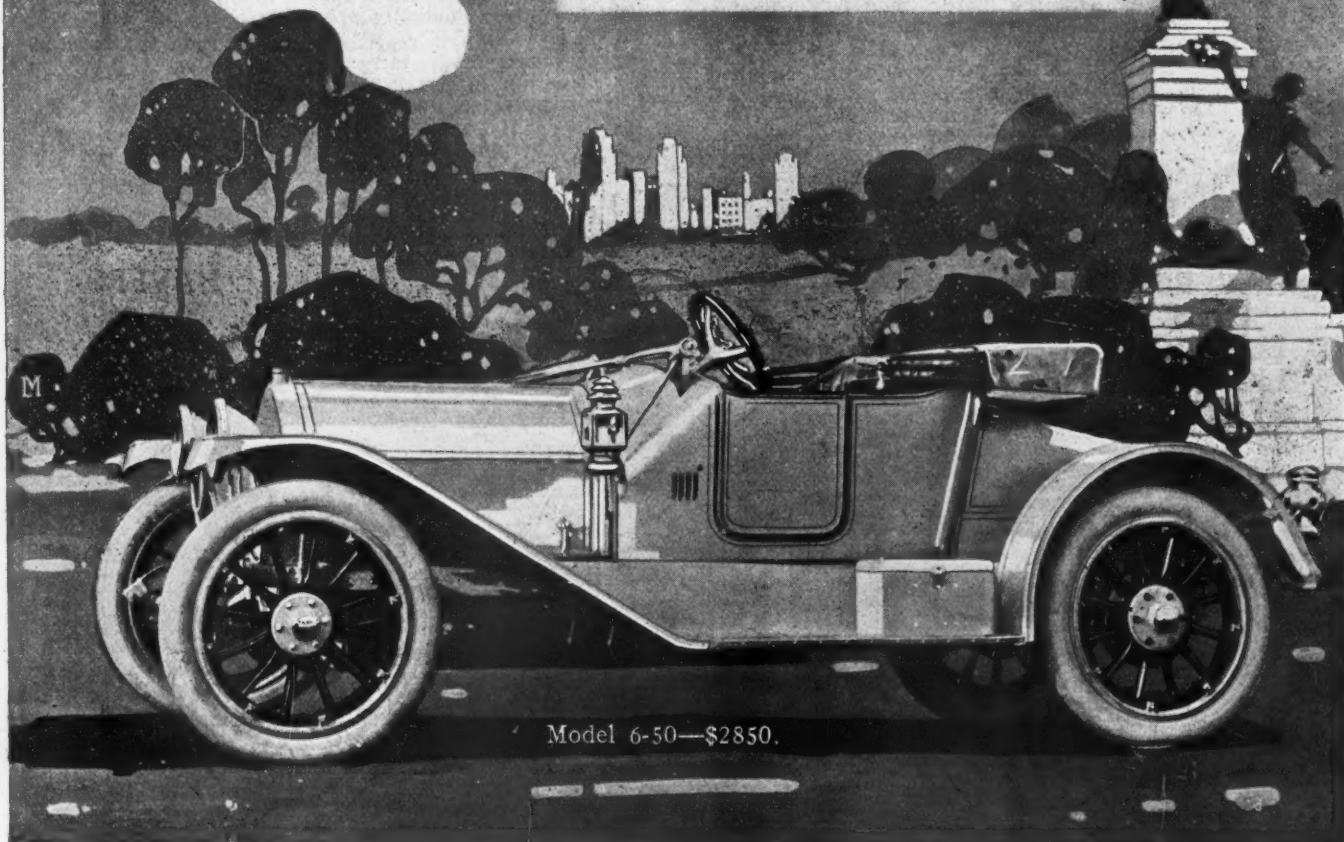
These are some of the strong points of KLINE KAR design and equipment. Back of them stands the KLINE quality and the KLINE guarantee, which means satisfaction to users and a surplus of profit to dealers.

Our models include two, four, five, six and seven passenger bodies with four or six cylinders.

Prices \$1850 to \$3500.

Write for our agency proposition.

KLINE MOTOR CAR CORPORATION
YORK, PA. RICHMOND, VA.



Model 6-50—\$2850.

The LUXURIOUS BROCC

Elegance and Roominess Mark the New Broc Models

THE BROCC actually offers more of comfort, luxury and beauty than intending purchasers expect in an electric.

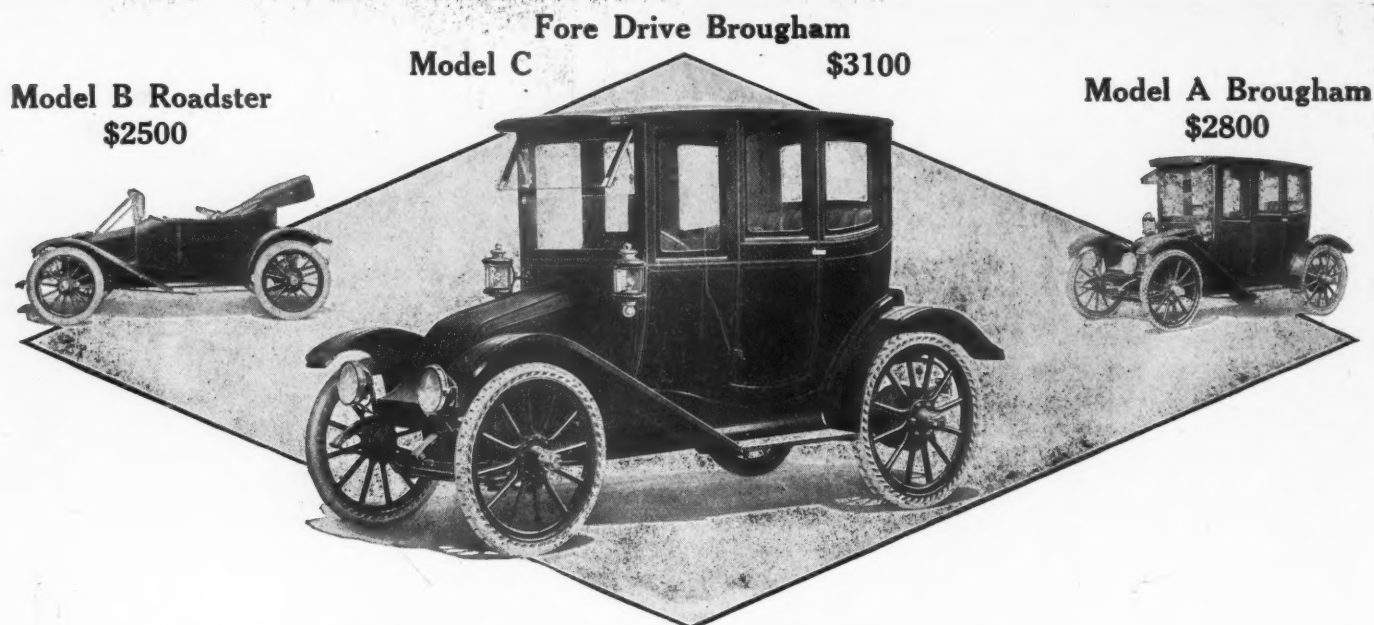
This page shows the interior of Model 29. Front seats revolve on safe, substantial pedestals; cushions are much deeper than those of any other make of electric; backs are shaped. There is ample head-room, body-room, foot-room. From cushion-top to ceiling is 44 1/2 inches.

The new Model 31 (also with pedestal front seats) is a forward-drive brougham for five passengers. It is built—as all Brocs are—with the most faithful attention to every detail of safety, comfort, convenience, beauty.

The Broc Electric Vehicle Co.
1675 East Fortieth St. Cleveland



Interior of Model 29, Rear-drive Brougham for five passengers, showing pedestal front seats



The Argo Electric

Measures the Worth of All Electric Cars

We firmly believe that the day is not far distant when all electrics will discard the last few remaining evidences of time-worn construction and build the more modern style of electric car.

And the degree to which they approach the Argo Standard will just as surely measure their worth in the esteem of electric car buyers.

The specifications which characterize the Argo contain every advancement and refinement that makes for the safety, comfort and convenience of the owner.

Read here those high class qualities which are offered in part in other cars, but as a whole only in the Argo.

General Chassis Specifications for all Models

Frame—5" pressed channel steel drop frame.

Springs—Front Springs, semi-elliptic, 38" sweep. Rear, full elliptic scroll, 38" sweep. All springs of nine leaves each of imported Krupp Silico Manganese Steel.

Axles—Front Axle, nickel steel, drop forged "I" beam. Rear Axle, full floating bevel gear type, equipped throughout with Hess-Bright ball bearings.

Brakes—Double internal expanding brakes on rear hubs, each set 14" in diameter, 1½" wide, with Raybestos facing.

Wheels and Tires—Artillery type, 38x4". Motz High Efficiency, 38x4"; pneumatic tires optional.

Steering—Gemmer Wheel steer, absolutely irreversible.

Lamp Equipment—Two powerful head lamps; latest pattern cylindrical side lamps; two interior lights and tail light. All finished in black enamel and sterling silver plated.

Motor—Westinghouse four pole series wound of unusual overload capacity with corresponding high efficiency at overloads.

Commutator—Very large and mica-slotted to prevent sparking. Commutator readily accessible through inspection covers.

Armature Bearings—Imported Annular silent type.

Control—Patent interlocking foot control, operated with right foot pedal. One movement throws off the power and applies the brakes, and vice versa.

Speeds—Five speeds forward and five speeds reverse, ranging from 4 to 25 miles per hour.

Drive—Power transmitted from motor to rear axle by means of Herringbone gear cased to form unit power plant with a complete elimination of universal joints or slip couplings.

Drive Shafts—¾ per cent nickel steel heat-treated.

Standard Equipment—Sangamo ampere meter, electric lighted on dash; hub odometer, sealed against tampering; electric horn; tire chains; bumper; full tool equipment; charging plug; jack hydrometer.

Finish and Color—Standard colors, Royal Blue, Brewster Green and Purple Lake, suitably striped. All metal parts are sterling silver plated. Upholstering, best quality of imported whipcord with broad lace trimmed to match. Complete set of cravenette slip covers to match upholstery.

Interior Equipment—Toilet Case, containing card case, memo, book, mirror and small bottle smelling salts; smoking set containing match box and ash tray; especially designed cut glass flower vase; adjustable arm loops on both sides of rear seat; Phinney-Walker eight-day clock; bevel mirrors adjusted above the front window for observing approachers from the rear; complete set of cravenette slip covers to match upholstery.

Individual Car Specifications

MODEL "A" BROUGHAM

Wheelbase—108½", the longest of any electric, carrying the load well between the axles, thereby insuring easy riding. Tread—standard 56".

Battery Equipment—Standard equipment, 40 cells of 11 plate, M. V. Exide Hycap. Either Edison or Ironclad Exide extra.

MODEL "B" ROADSTER

Wheel Base—108½", carrying the load well between the axles, thereby insuring easy riding. Tread—standard 56".

Battery Equipment—Standard equipment, 40 cells of 11 plate, M. V. Exide Hycap. Either Edison or Ironclad Exide extra.

MODEL "C" BROUGHAM

Wheel Base—110", carrying the load well between the axles, thereby insuring easy riding. Tread, Standard 56".

Battery Equipment—Standard equipment, 40 cells of 11 plate, M. V. Exide Hycap. Either Edison or Ironclad Exide extra.



The Perfection of the Argo Electric

Establishes the Standard of Electric Vehicle Construction

There is nothing particularly sensational in the Argo's rapid rise to favor—

Building a **good** car is not a matter of years—

It is more a problem of manufacturing ability—

The Argo Electric Vehicle Company have built only **one** car—

But the perfection of that one car has established the Standard of Electric Vehicle Construction—

The splendid ability that designed the Argo is joined to the acknowledged manufacturing superiority of The Lufkin Rule Company, under whose exacting eye the Argo is built—

These master engineers and manufacturers have worked with a definiteness of purpose—

Toward one achievement—

To build **one** car as well as they knew how—

They have worked slowly—steadily—surely—planning and providing every improvement that might mean added safety—comfort—and convenience to the owner.

The Argo Builders saw Public Opinion place its stamp of disapproval upon the unsightly and unsafe high-carriage construction—

They knew that very soon this growing protest would demand a wheel steered car—

They foresaw the complicated side-control giving way to the automatic foot-control and brake—

They realized the folly of a wheel base of less than 100 inches—

There were no time-worn prejudices or expensive alterations to be overcome in the Argo factory—

They were creating for the future—not rebuilding from the past—

The Argo first announced their car in 1912, presenting even then conveniences and refinements far beyond the latest improvements of competition—

In ninety days—300 Argo Electrics found a dignified and careful ownership—

There was no theory attached to its instant acceptance—

With scarcely a line of advertising, the Argo output of 1912 was accepted because it had rightly earned the choice of buyers—

But most of all it is the feeling of confidence inspired in your prospects by this advertising that will bring them to your show rooms firmly convinced that the worth of electric vehicles as a whole is measured by a close comparison with the Argo Standard.

"But," you say, "Now that the Argo has pointed the way, cannot its standard be successfully copied?"

Copied, yes, for competition always follows fast on the heels of progress—

Successfully, no—for individuality in a manufactured product must ever set the mark for those who follow after—

If the past ten-year progress in the electric field marks a precedent, the Argo will always be far in advance of its nearest competitor—

Not only in manufacturing superiority and design—but in the high esteem of electric car buyers—

"But what is my position as a dealer?" you ask—

"Is mine the burden of advertising the Argo Electric to my trade?"

Decidedly not—

Mr. Carl Metzger, General Sales Manager of the Argo, is far too experienced in the sale of electric cars not to realize the limitations that would result, if he imposed upon you a task that should rightfully fall upon the manufacturer—

He says—"Twelve years as a General Sales Manager of another electric vehicle company have proved to me three big facts:

"First: That any manufacturer who asks his dealer to assume the advertising burden in his territory is asking him to do a thing in which he, himself, does not believe—

"Second: Publicity in the magazines of general circulation will do much to increase the popularity of a manufacturer's trade mark, but very little toward adding to the profits of his dealer.

"Third: If a manufacturer conscientiously wishes to help his dealers through advertising, he must talk to that dealer's prospects in their local paper and over his dealer's name."

That is exactly the Argo policy for 1913—

\$50,000.00 will be spent to tell the Argo story—in your local newspaper, over your name—

Our profits are dependent upon your profits—

It is Mr. Metzger's enthusiasm and careful interest for his dealers that will make possible this most effective advertising campaign—

It is Argo quality and individuality, that will make you point with pride to a car you can unreservedly guarantee for service and satisfaction.

Metzger-Herrington-Argo Co., Distributors
2412-2414 Michigan Avenue, Chicago, Illinois

Argo Electric Vehicle Company
Factories—Saginaw, Michigan
Builders of Electric Pleasure and Commercial Vehicles



When Writing to Advertisers, Please Mention Motor Age.



FOOT CONTROL

THE action of walking is so natural you never give a thought to how it is done, although, to start, you raise one foot—to stop, you place both feet on the ground. Just as simply and unconsciously the owner of a Buffalo Electric controls the starting, stopping and speed of his car—all by the foot control—an exclusive Buffalo Electric feature. You do not walk with your hands—why start, go slowly, fast or stop a car in an unnatural manner. Foot control on Buffalo Electrics is the natural control.

Raising the foot pedal releases the brakes and applies the power—depressing the pedal shuts off the power and applies the brakes.

In driving thru congested traffic, even in case of danger of collision, your first impulse is to brace down with your foot and, to your joy, if you drive a Buffalo Electric, you find this involuntary action compels the car to respond almost as to a wish. Your hands meanwhile are free to guide the car; either or both employed for the purpose, as you desire.

Besides the factor of safety, Buffalo Electric foot control means greater battery economy.

BUFFALO ELECTRIC VEHICLE CO.

Factory and General Office:

1220 Main Street, BUFFALO, N. Y.

BOSTON

NEW YORK

PHILADELPHIA

MONTREAL



When Writing to Advertisers, Please Mention Motor Age.



Buffalo Electrics for 1913 will be shown in Grand Central Palace—Space No. 6—from January 11th to 18th.

When you see them at the Show (we will be at the Coliseum, too), stop and go over every detail thoroughly.

Probably this is the first time you have been asked to consider the chassis elements of an electric. The reason is this:

Buffalo Electric architecture is automobile architecture. Buffalo Electric design is automobile design. Buffalo Electric engineers are among America's foremost automobile engineers.

Consider the advantages of a Buffalo Electric Agency.

FEATURES:

Single reduction, Direct Shaft Drive
Foot Control—Independent of hand lever
Three point motor suspension—with the Direct Shaft Drive
Extra battery capacity
Wire wheels as optional equipment

THE LINE:

2 Passenger Coupe, Model 29
4 Passenger Vis-a-Vis Coupe, Model 30
4 Passenger Forward Drive Coupe, Model 30-B
Trucks, 1500 pounds to 2 tons
Industrial and Factory Trucks

Any one of the above features is sufficient to sell the ordinary electric—all the above features in one car—think! These are only a few advantages of Buffalo Electric make-up. Buffalo Electrics have a faster get-away and are faster in traffic than gas cars. They are more efficient and economical in every use than other electrics.

If you do not attend the Show, write for descriptive literature, agents' terms, and other information.

BUFFALO ELECTRIC VEHICLE CO.

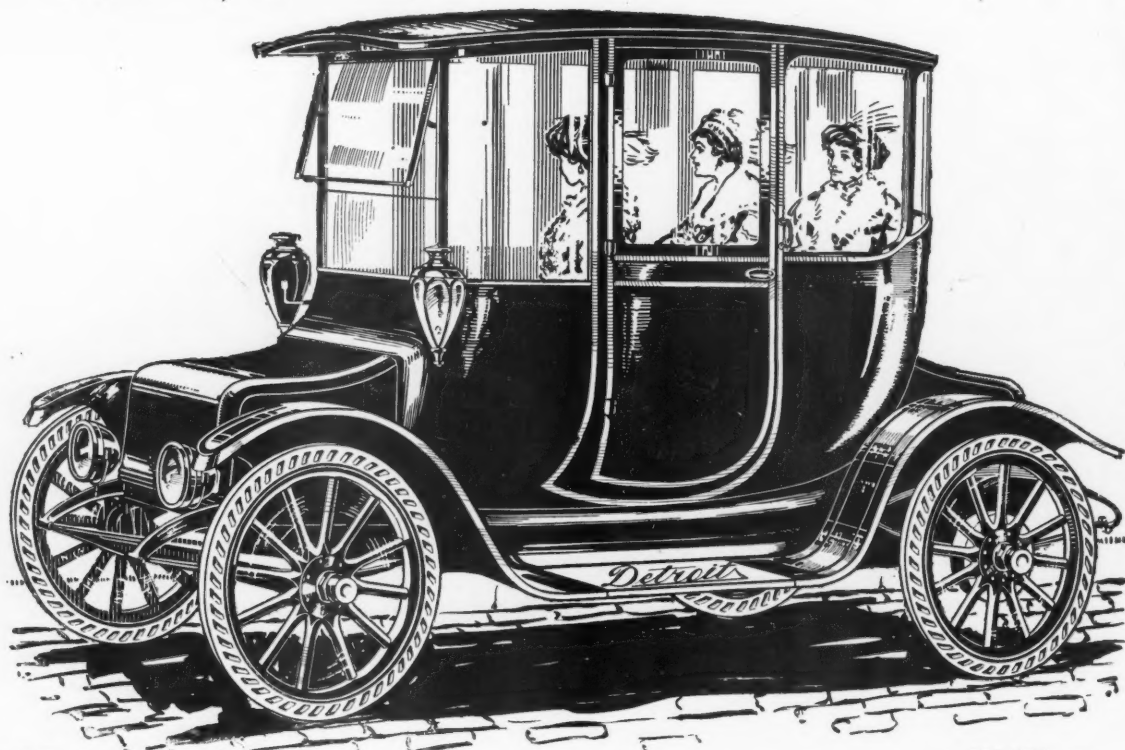
Factory and Salesrooms:

1220 Main Street, Buffalo, N. Y.



When Writing to Advertisers, Please Mention Motor Age.

THE Detroit Electric Society's Town Car



Clear Vision Brougham

MODEL 42

Why Not Buy a Detroit Electric?

That is a fair question, is it not? Let us fairly answer it together by analyzing your automobile needs.

Won't at least 90% of your driving be done in the city and its environs? Admit that you may (?) do some touring, you can well afford to hire a car for this purpose and then be money ahead at the end of the year, but that is not the big point.

For all occasions—business and formal—in all kinds of weather, the Detroit Electric Clear Vision Brougham will meet all of your requirements economically with every luxury of the most expensive limousine, minus the necessity and inconvenience of a chauffeur. It has all the mileage you can possibly need. It can climb any hill that any other car of any type will climb.

If you wish to install your own charging set, the current will cost you less than any other form of energy. Oil is not a big item as there is no complex mechanism requiring it. If you wish to have your car garaged—called for and delivered, washed, adjusted and charged—you can have this

done for a nominal charge of from \$35 to \$40 per month, which includes the cost of the current used in charging.

What other type of car can offer you any such luxurious service at anywhere near the price?

Then there is the tire question. In the Detroit Electric you get cushion tires guaranteed for 10,000 miles. They will always bring you home.

Another point—when you buy a Detroit Electric there is no extra equipment problem. It is electrically started and electrically lighted. It has all the advantages of electricity—not one or two of them.

You will appreciate the Detroit Electric in congested traffic. All speeds are instantly available with one lever. There is no possible chance for your motor to stop when changing speeds.

Quick "get-away" is a pleasure.

Our new 1913 catalog has just arrived. It will be sent upon request. Our new model 42 Clear Vision Brougham for 1913 is now here. Let us take you for a ride in this car over any roads or hills that you may select.

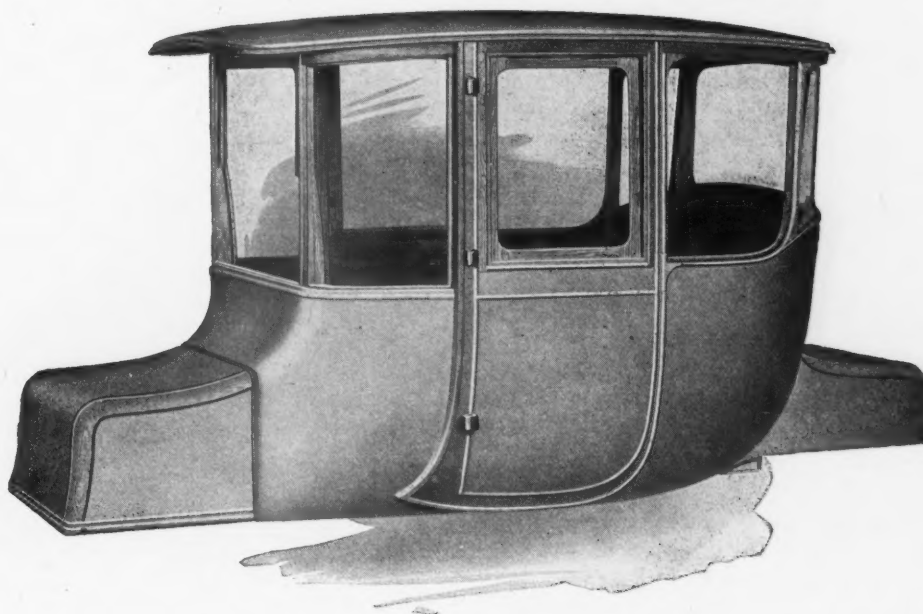
ANDERSON ELECTRIC CAR COMPANY
415 CLAY AVENUE, DETROIT, U. S. A.

BOSTON
BROOKLYN
BUFFALO

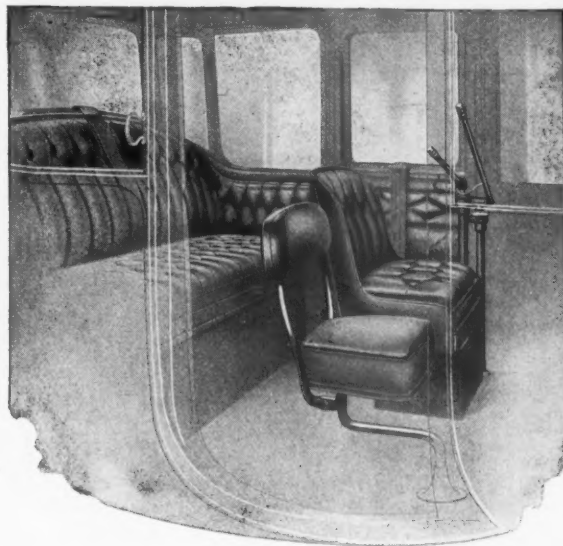
BRANCHES:
NEW YORK—Broadway at 80th St.
CHICAGO—2416 Michigan Ave.

CLEVELAND
EVANSTON
KANSAS CITY
MINNEAPOLIS

Detroit Electric Bodies of Finest Material and Highest-Grade Workmanship



The panels, mouldings, window sash and roofs of Detroit Electric bodies are made of **pure aluminum**, the advantages of which type of construction are readily seen.



Aluminum permits of shaping into more artistic lines than any other material. There are no sharp angles, or square corners in the bodies of the Clear Vision Brougham. Beautiful, rounding, curved effects are much in vogue and are only possible with aluminum which can be shaped as easily as gold and silver and after hardening, has the tensile strength of iron.

Aluminum is lighter than wood, which is a big item in saving weight. It takes a beautiful finish and retains it without warping, cracking or checking. Detroit Electric bodies remain beautiful. The greatest care is taken to eliminate all noise. Bodies are cushioned from the chassis frames. A thick layer of felt matting is put between the aluminum roof and the top ribs of the frame for this purpose. Fenders are also of aluminum, each pair being fully enclosed between step and body.

Clear Vision Features—New Seating Arrangement

The Clear Vision feature of the 1913 Detroit Electric, with all seats facing in the direction of travel, gives an unobstructed view ahead to all occupants. No one is compelled to sit facing backward. The driver sits in one of the front seats, an arrangement which insures safety and comfort, obtainable in no other way. The seats are all so centrally located that the driver is in no way noticeable whether alone or with others.

ANDERSON ELECTRIC CAR COMPANY
415 CLAY AVENUE, DETROIT, U. S. A.

BOSTON
BROOKLYN
BUFFALO

BRANCHES:
NEW YORK—Broadway at 80th St.
CHICAGO—2416 Michigan Ave.

CLEVELAND
EVANSTON
KANSAS CITY
MINNEAPOLIS



The Speeding Up Process

NATURE believes in the weeding out process. She starts 60 seedlings growing, but develops only 20 real trees.

In the industrial world it is the best machines and tools which survive. Waste is sooner or later eliminated. And one improved machine usually speeds up all the other processes identified with the manufacture or transportation of a given product.

Until we had the Motor Truck we didn't know how inefficient and wasteful were our methods of delivery with horseflesh. **The horse was efficient only so long as other methods of transportation were on par with him.** With the telephone, the 20th Century Limited, and the Automobile the trackless delivery of merchandise had to be speeded up to keep pace with other things. **The horse couldn't be speeded up,** so he had to be **weeded out**; of the city at least.

The gasoline truck should never be used in the field of the Electric, and the reverse is true. Economically speaking,

the Electric Truck belongs in the field of short-haul frequent stop work. The gasoline truck will not pay in this field. It will pay and pay big in long hauls, with few stops. Together the two types make possible the speeding up process in the trackless transportation of merchandise.

"Weed out" if you would "speed up."

You can argue until you are black in the face that Electric Trucks are not perfected, but that won't prevent the sale of some Ten Million Dollars' Worth in 1913 to satisfied customers.

It hasn't prevented us making nine customers absolutely "horseless" and they use over 100 G. V. Trucks between them. One brewer is saving \$80,000 per year with his fleet of 57 G. V. Trucks. He released \$5,000 worth of real estate by putting in the G. V. system.

Don't fail to read the next page, as it contains much information that you ought to know as a progressive man. Read it if you never expect to own a horse.



G. V. Electric Trucks

G. V. Electric Trucks were the pioneer Electric trucks and they are the leaders still. Thousands in use in 104 lines of trade. The only really standardized Electrics with interchangeable parts. The only long-established line of six graduated capacities.

Twenty-five (25) firms already operate 941 G. V. Electrics, an average of over 37 each. Leading retailers use 488, express companies 300, brewers 522, manufacturers and wholesalers thousands more. From Portland, Me., to San Diego, Cal., from Toronto, Ont., to Dallas, Texas, G. V. Electrics dominate their field. Manila has 23 with 16 more on order, Rio de Janeiro and Havana 13. They are used in Montreal and Minneapolis **in the winter time**, also.

G. V. Electrics are the logical trucks for city and suburban work.

Scores of G. V. Trucks and Wagons built in 1901 and 1902 are still in service. Some of these relatively crude models consumed as much current running "light" as the 1913 product does "loaded." In some big G. V. fleets you can see what corresponds to the G. V.

"one lugner" running side by side with the G. V. "six." That's what brings us re-order business—the **certainty** of G. V. efficiency and long life.

G. V. Electrics are the simplest trucks made. Only one motor, everything accessible, yet important parts housed. Ex-teamsters operate over \$5,000,000.00 worth.

Don't worry about Electric Truck "limitations." It's not a case of how many miles you can drive the truck per day, but how much mileage you really need for the average day's work. Where you have to make from 100 to 150 stops (and waits) per day, your mileage is limited by your working day. That's why G. V. Electrics with their average of 50 miles per battery charge, their exceedingly low cost of operation, and small replacement costs over a period of years, are such a success. They are surprising the whole country with their comparative efficiency and economy.

Can't we send you some bonafide costs of operation for G. V. Trucks and comparative horse costs?

Catalogue 102A on request.

The General Vehicle Company, Inc.

Principal Office and Factory

Long Island City, New York

New York

Chicago

Boston

Philadelphia

St. Louis

Minneapolis

Cincinnati



CHURCH-FIELD BROUGHAM

Church-Field Electric

The Church-Field Electric combines the convenience, the simplicity of operation, the economy and the elegance of the electric vehicle with the perfect control, the power, the reliability and the general efficiency of the gasoline motor car.

It is pre-eminently the car of the discriminating man or woman who demands that the family conveyances be expressive of personality and place in the community.

The Church-Field is the only electric car that has a two-speed planetary transmission.

This means an enormous saving in the cost of maintenance, because it minimizes the wear and tear on the batteries and the consumption of current.

Furthermore it places the Church-Field on the same footing with the gasoline car in climbing hills—the crucial test of power.

In a few words, the Church-Field is the electric of most power, the most perfect control—and the most elegant—and distinctive.

To convince you of this, we only ask that we be allowed to demonstrate the Church-Field to you.

A Few Church-Field Electric Features

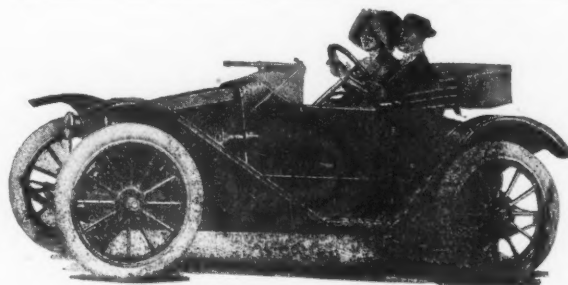
Ten point-speed control.

Two-speed Planetary Transmission.

Specially designed and patented springs.

Specially manufactured motor with 75 to 100 per cent more power than those used in most electrics of similar type.

Body is low, underslung, preventing skidding and permitting easy entrance and exit.

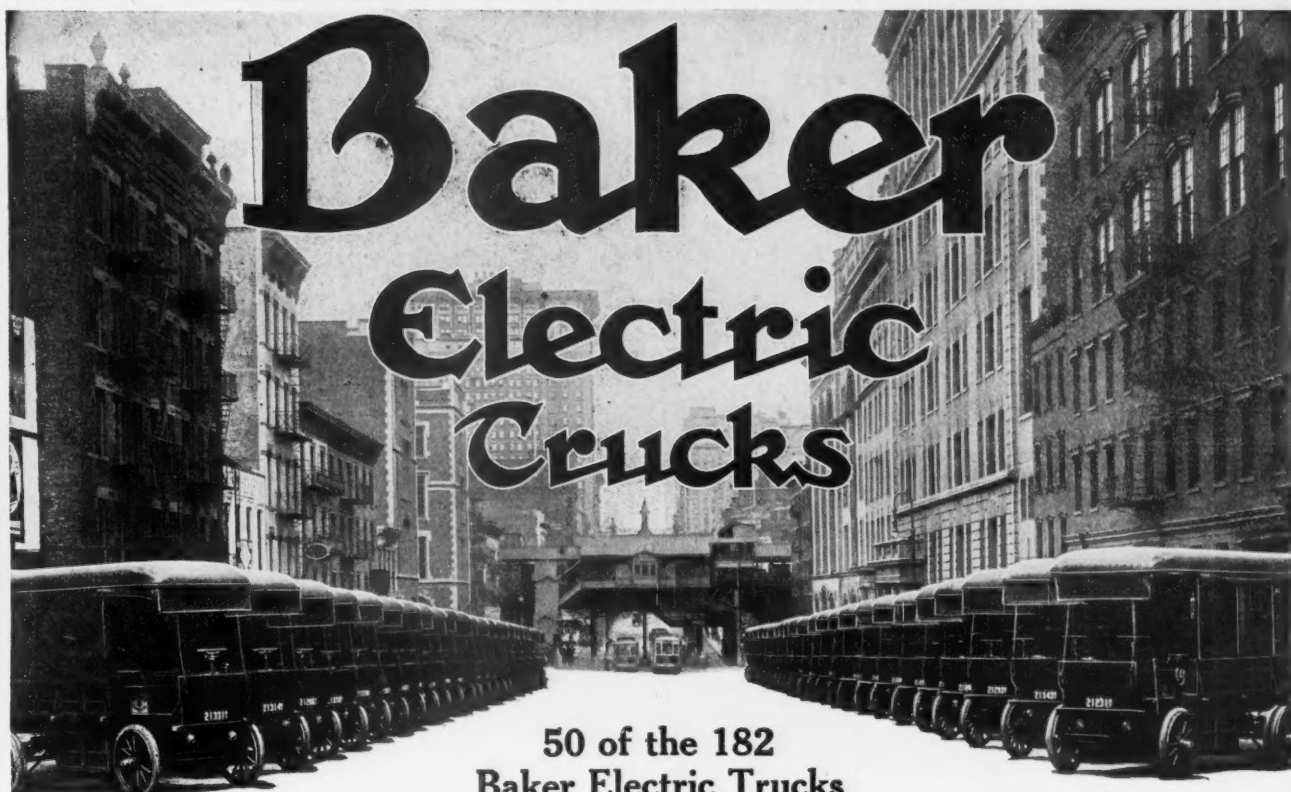


CHURCH-FIELD ROADSTER

The Church-Field Motor Co.,

Sibley, Mich.

When Writing to Advertisers, Please Mention Motor Age.



50 of the 182
Baker Electric Trucks
Purchased by American Express Company

A modern merchandise delivery system is chiefly governed by two factors—Economy and Reliability. One of the great concerns to make a special study of this problem in the light of modern transportation requirements was the American Express Company, and to give themselves ample opportunity to try out various cars in their own way they purchased several of different makes, both electric and gasoline, and put them into service.

Over two years of exhaustive comparative tests followed, under conditions calculated to demonstrate beyond all doubt the superiority of one vehicle over another, and the results obtained from the Baker Electrics in these tests, both as to Economy and Reliability, were so highly satisfactory that this Company placed an order for 50 Baker Electrics. It has since placed additional orders, making a total of 182 Bakers.

Any business, large or small, that wants to save money in its delivery department, should get the facts about the wonderful Baker. It is—first, last and all the time—the truck of Economy, coupled with unequalled Reliability.

Economy of Operation: On account of the small amount of current it consumes—less per ton mile

The Baker line extends from 500-lb. to 4-ton capacity—all having the service-backing of the largest plant in the world devoted exclusively to the manufacture of electric vehicles

Let us study your delivery problems. Our Transportation Cost Bureau is at your disposal without charge or obligation.

OPEN TERRITORY: We solicit applications from men or concerns in unoccupied territory who are equipped to handle the Baker along the lines the merit of the truck deserves.

THE BAKER MOTOR VEHICLE CO., CLEVELAND, OHIO

Manufacturers also of Baker Coupés, Victorias and Broughams

Canada: The Baker Motor Vehicle Co. of Canada, Ltd., Walkerville, Ont.

Los Angeles, Tenth and Olive Sts
Kansas City, 3105 Gillham Road
Detroit, 815 Woodward Av

Chicago, 2023 Michigan Av
New York, 1798 Broadway
Washington, 1138 Connecticut Av

Spokane, 818 Fourth Av
Boston, 801 Boylston St
Seattle, 1718 Broadway

Sacramento, 1217 Seventh St
Richmond, 1623 West Broad St

Philadelphia, 1927 Market St
Denver, 1542 Broadway

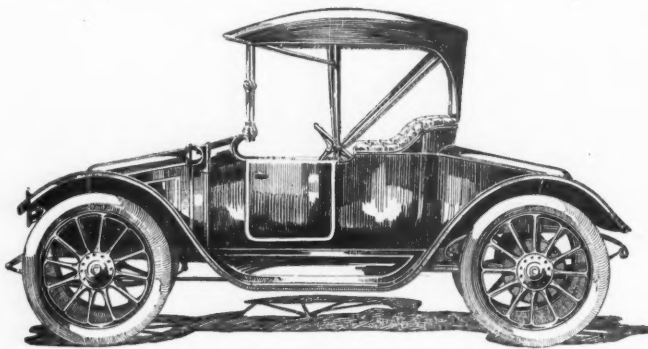
Representatives in Other Leading Cities



**Mr. Dealer: The Borland is the Electric
to satisfy the owner and profit the agent.
Secure your territory now for 1913.**

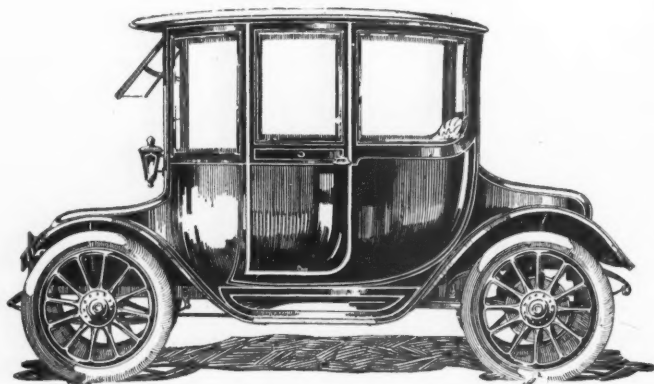
The secret of Borland superiority is **construction**. Mechanical perfection only can constitute an electric which does what the Borland does. For instance: **the run from Chicago to Milwaukee** (104 miles), under adverse conditions, on **one battery charge**, is conclusive evidence of the fact that the Borland owner gets plus-service on his battery equipment.

For appearance, satisfaction, comfort, safety, convenience and **mileage** the Borland is the most convincing electric known.



The Borland 1913 Roadster—It will be a great **Business** and Professional Men's car **\$2550**

Specifications: General Electric motor, especially built for us to withstand a 500% overload. General Electric non-arcing controller with 6 speeds forward and 3 reverse. Interlocking device attached to brakes to cut off current when brakes are applied. Current is still cut off until Control Lever is returned to neutral position. Control lever horizontal type. Wheel base, 96 inches. **Batteries:** 42 cells, 11 plate Exide. **Speed:** 35 miles per hour. **Equipment:** Skid chains, hydrometer, odometer, pneumatic tires, 34 x 4.



The Borland 1913 Regular Coupe—**\$2900**
A beautiful and elegant production

Specifications: General Electric motor, especially built for us to withstand a 500% overload. General Electric non-arcing controller with 6 speeds forward and 3 reverse. Interlocking device attached to brakes to cut off current when brakes are applied. Current is still cut off until Control Lever is returned to neutral position. Control lever horizontal type. Wheel base, 96 inches. Extra large aluminum 5-passenger body, revolving front seats, either front or rear drive. **Batteries:** 40 cells, 9 plate Exide. **Speed:** 22 miles per hour. **Equipment:** Skid chains, hydrometer, odometer, toilet case and flower vase. Solid or pneumatic tires, optional, 34 x 4.

Our 1913 electrics recognize and cater to the advanced ideals and demands of the public.

These beautiful Borlands, 1913 models, will delight every woman who sees them and will sell themselves to the men.

The agent who sells a Borland to a man or woman is creating a continuing business for himself. The absolutely perfect construction of the Borland eliminates the necessity for repairs due to defective material or workmanship, and insures the dealer the greatest final profit on each sale.

With our increased factory facilities we have trebled our output, and are now in position to make very attractive propositions to dealers throughout the country.

Besides the models illustrated we are making: Brougham, \$2500; Coupe, \$2700, either front or rear drive; Limousine, \$5500; 1500 pound delivery truck, open body, \$2100; 1500 pound truck, with closed body, \$2250. These models make a complete line for dealers to handle.

Catalogue and other literature sent immediately on request. Protect yourself and be the Borland man in your locality. Write or wire for agency terms at once.

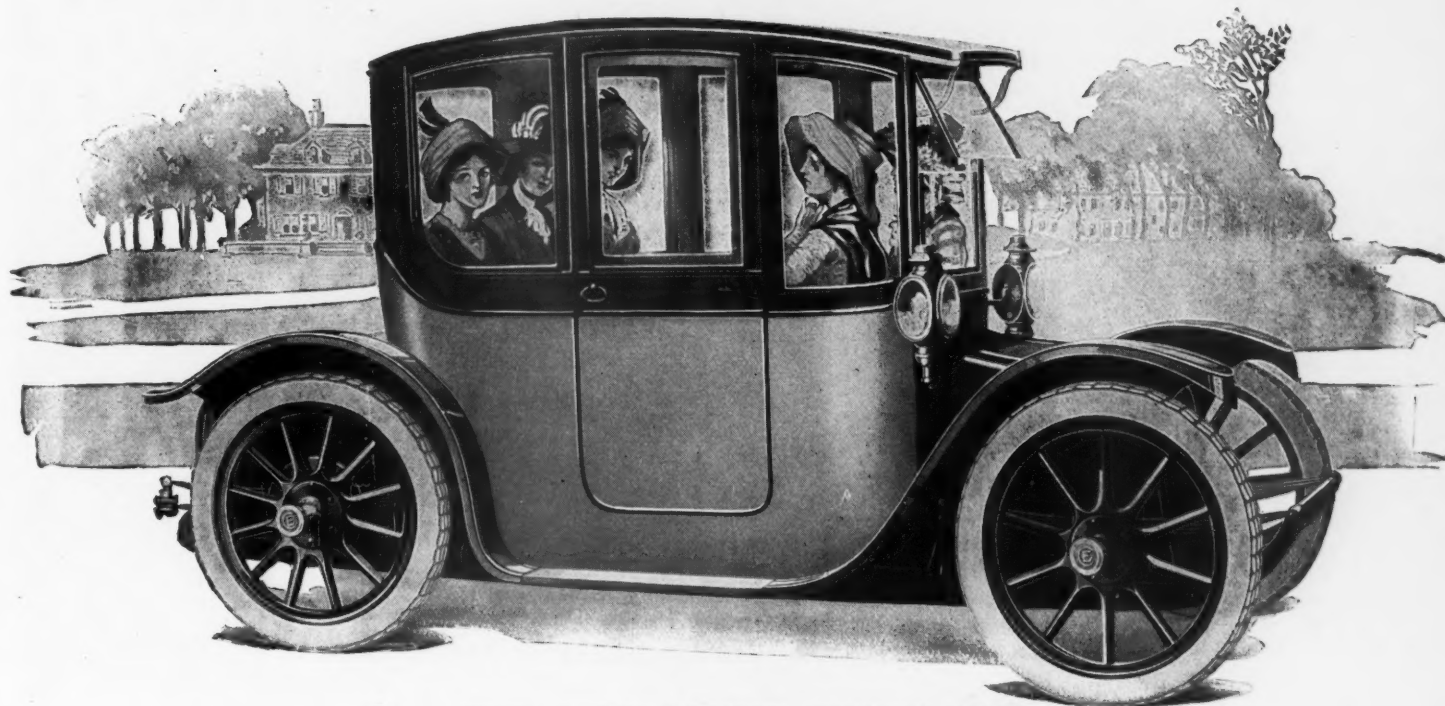
U. B. Grannis, Vice President, will be at the Waldorf Hotel during the New York Show. He will be pleased to give dealers full information concerning the Borland Line.

Exhibit at the Chicago Show, Space A-1, First Regiment Armory

The Borland-Grannis Co.

2634 Michigan Avenue Chicago

The Century Electric



MODEL B—FIVE PASSENGER BROUGHAM—\$2550

A CAR whose superb proportions distinguish it at a glance from the conventional every-day type.

Close and careful consideration of its hand-finished body, its rich upholstery, its economy of maintenance, and its safe simplicity of operation prove that the Century's outward beauty of line is fully equalled by its efficiency and the sumptuous character of its interior appointments.

The advancement of the electric to its present high standard of efficiency offers the wide-awake dealer a far greater opportunity than ever offered by the gasoline car.

Shrewd dealers who have waited for an electric such as the Century, which combines the last word in coach-building with the highest advance in electrical engineering, will find the Century the easiest, the readiest, the most satisfactory car, whether electric or gasoline, they have ever had a chance of connecting with.

Responsible and progressive dealers who appreciate these sales advantages are requested to write or wire for unallotted territory.

Century Electric Car Company
Woodward Avenue, Detroit, Michigan

When Writing to Advertisers, Please Mention Motor Age.



"Let the Lamp of Experience Light Your Way"

Some Shining Lights
"57 Varieties"
in the Electric Field
who use
F&S Ball Bearings
The Dependable Kind—
Made in Germany

Westinghouse	General Electric
Gray & Davis	Otis Elevator Co.
Wagner El. Co.	Taft-Pierce M. Co.
Pyle N. E. H'dlight Co.	Michigan Magneto Co.
Crocker-Wheeler Co.	Regina Co.
Robbins & Myers Co.	Triumph Elec. Co.
Kinectic Eng. Co.	Schroeder Head'l't Co.
Spencer Turbine Co.	Esterline Co.
Apple Electric Co.	Bicalky Fan Co.
Okey Mfg. Co.	Pneumelectric M. Co.
Electro L. & S. Co.	Dyneto El. Co.
Kokomo E. Co.	Eck D. & M. Co.
Astoria L. H. & P. Co.	

Rauch & Lang Ca'g Co.	Woods M. V. Co.
Baker M. V. Co.	Studebaker Corp.
Columbus B. Co.	Waverly Co.
Walker V. Co.	Standard E. Car Co.
Clark M. Car Co.	Borland-Grannis Co.
Dayton M. Car Co.	Argo E. V. Co.
Grinnell E. Car Co.	Colonial E. Car Co.
J. G. Phipps E. Car Co.	Broc E. V. Co.
Iowa W. & P. Co.	Century E. M. Co.
Washington M. V. Co.	Joliet Auto Truck
H. McFarlane & Co.	Cleveland Motor Truck
Bryce Baking Co.	H. H. Babcock Co.
M. & P. Elec. V. Co.	Lansing W. Co.
Battendorf Axle Co.	Chas. K. Davis
Champion Wagon Co.	Atterbury M. Car Co.
Bijur M. L. Co.	Atlantic V. Co.

FBRETZ COMPANY
F & S
Ball Bearings
250 West Fifty-fourth, New York



The Chicago Electric

This luxurious equipage, without a peer in point of engineering excellence and classic beauty, answers a nation-wide demand.

¶ Here is an electric pleasure vehicle that commands the attention of every dealer in the United States, because of its superlative and distinctive qualities. It answers absolutely a nation-wide demand for an electric of the highest constructional efficiency and incomparable grace of body design.

¶ This Electric is the crowning achievement in the life of Frederick J. Newman, overshadowing all his past triumphs in electric car building.

¶ Behind this car stands an organization of noted Electric Car experts, each one of

whom has attained notable success in this industry. These men have given their best thought and efforts to the Chicago Electric because they fully perceived the enormous possibilities of this perfect pleasure car. These same opportunities are open to the dealer who realizes the limitless field for an Electric of such pre-eminence.

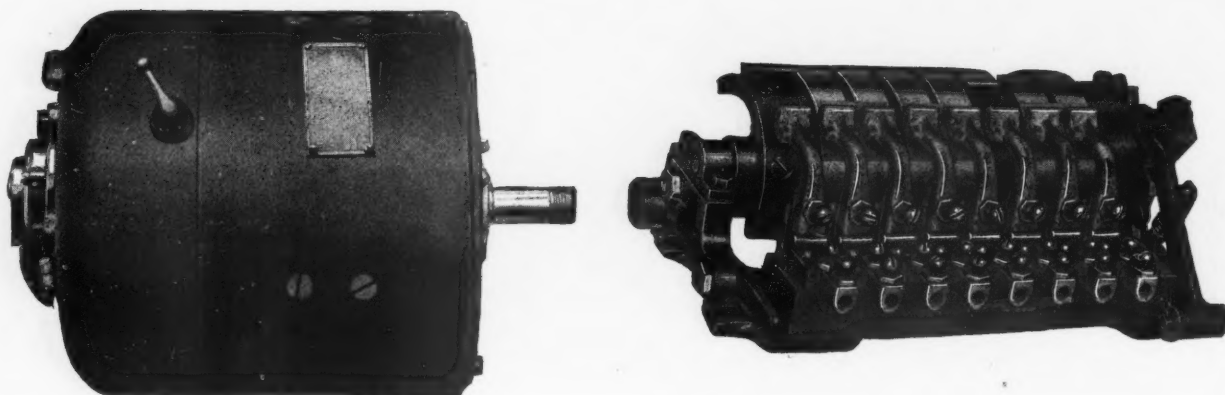
¶ The Chicago Electric 1913 Models will be exhibited at the Chicago Automobile Show only. Our factory and sales organization are located here and we are thus enabled to do complete justice to our display.

*The new cars are now ready for delivery.
We respectfully invite correspondence.*

Chicago Electric Motor Car Co.
3600 South Morgan Street
Chicago

[23]

Electric Vehicle Equipment



Leading Makers of Electrics Use G-E Motors and Controllers

The best "argument by example" that General Electric Company's automobile motors and controllers hold an established reputation as the most reliable and efficient equipments made, is proven by the use of these outfits on SIXTY-FIVE PER CENT of Electric pleasure and commercial vehicles made by the leading manufacturers in this country.

The manufacturer who safeguards his reputation by adopting GENERAL ELECTRIC COMPANY'S motors and controllers as standard, is thus able to concentrate greater attention upon the comfort, convenience, finish and general detailed improvement of car body and chassis.

The electric vehicle equipped with G-E motors is doubly backed: first, by its maker, and second, by the reputation of the largest electrical manufacturer in the world.

If you are a prospective purchaser of an electric vehicle, DEMAND General Electric Company's motors and controllers!

General Electric Company

Largest Electrical Manufacturer in the World

General Office:
Schenectady, N. Y.

Sales Offices in
All Large Cities

8406

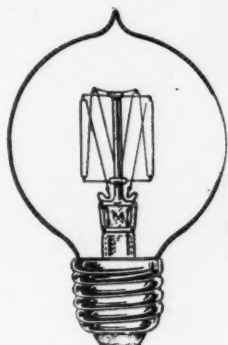
The Guarantee of
Excellence



on Goods
Electrical.

When Writing to Advertisers, Please Mention Motor Age.

Electric Vehicle Equipment



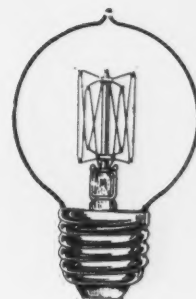
($\frac{1}{2}$ Size) 15 and 25 watts, 21-90 volts



Three-gang Push Button Switch



Commercial Vehicle Charging Receptacle and Plug



($\frac{1}{2}$ Size) 15 and 25 watts, 21-65 volts

Edison Mazda Lamps, Commercial vehicle type, are of the same high efficiency as the well-known Edison Mazda Lamps used for all kinds of lighting the world over. These lamps have strong, sturdy filaments, made from drawn wire tungsten that will withstand the jarring and jolting of the roughest roads.

Flush Push Button Switches are our well-known, standard push button switch in miniature. The switch is compact and takes up very little space. The buttons are metal and will not break off; the terminal plate at back is held by long screws which prevent loosening. Made in any combination of gangs.

Charging Plugs and Receptacles

are substantial and strong; they withstand any reasonable amount of rough usage. The self-centering plug forms a rigid electrical connection between contacts; the generous areas assure transmission of charging current at the maximum of efficiency. Well insulated against accidental contact. Receptacle has a self-closing cover, protecting removable interior from moisture and dirt; interior walls enameled to prevent rust. Any of these devices may be obtained from local dealers or our nearest sales office.

General Electric Company

Largest Electrical Manufacturer in the World

General Office:
Schenectady, N. Y.

Sales Offices in
All Large Cities

3871

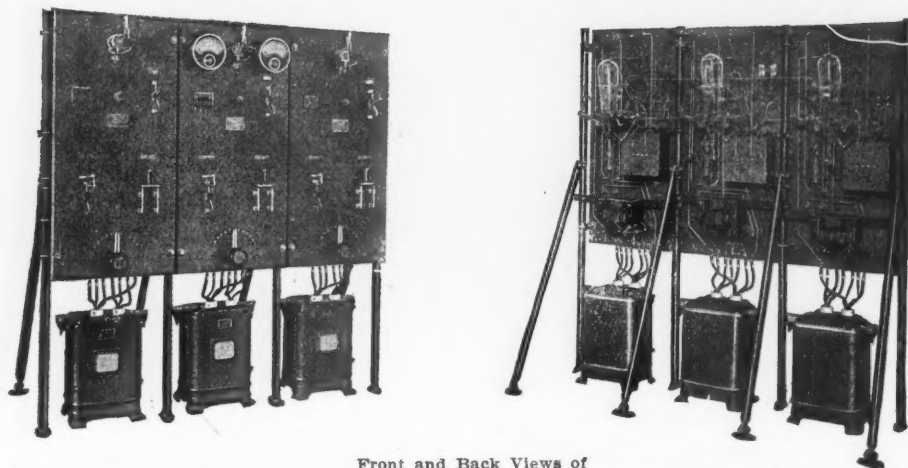
The Guarantee of
Excellence



on Goods
Electrical

When Writing to Advertisers, Please Mention Motor Age.

Battery Charging Equipment



Front and Back Views of
Three Panel Commercial Vehicle Type Rectifier. This set will charge three vehicles at once.

Convenience in Battery Charging With Mercury Arc Rectifiers

The idea that charging storage batteries is a mysterious and difficult operation has been handed down from the days of the earliest electricians when charging stations were few and far between and the charging outfit for the private garage was unknown.

These conditions have been changed by the invention of the rectifier, which rectifies or changes the alternating current furnished by most lighting and power companies to direct current suitable for charging storage batteries.

With one of these rectifiers in the garage, all that is necessary to charge the battery is to insert a plug in a receptacle on the vehicle and start the rectifier.

The rectifier takes up very little space in the garage and can be installed anywhere there are electric light wires.

In nearly every case the electric power company will make very low rates for energy for battery charging.

Write our nearest office for further information and prices.

General Electric Company

Atlanta, Ga.
Baltimore, Md.
Birmingham, Ala.
Boise, Idaho
Boston, Mass.
Buffalo, N. Y.
Butte, Mont.
Charleston, W. Va.
Charlotte, N. C.
Chattanooga, Tenn.

Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio
Columbus, Ohio
Davenport, Iowa
Dayton, Ohio
Denver, Colo.
Detroit, Mich.
(Office of Agent)
Erie, Pa.

Largest Electrical Manufacturer in the World
General Office: Schenectady, N. Y.
Indianapolis, Ind.
Kansas City, Mo.
Keokuk, Iowa
Knoxville, Tenn.
Los Angeles, Cal.

ADDRESS
NEAREST
OFFICE

New Haven, Conn.
New Orleans, La.
New York, N. Y.
Philadelphia, Pa.
Pittsburgh, Pa.
Portland, Ore.
Providence, R. I.
Richmond, Va.
Rochester, N. Y.
Salt Lake City, Utah
Nashville, Tenn.

San Francisco, Cal.
St. Louis, Mo.
Schenectady, N. Y.
Seattle, Wash.
Spokane, Wash.
Springfield, Mass.
Syracuse, N. Y.
Toledo, Ohio
Youngstown, Ohio

For Texas and Oklahoma business refer to General Electric Company of Texas—Dallas, El Paso, Houston and Oklahoma City.

For Canadian business refer to Canadian General Electric Company, Ltd., Toronto, Ont.

3390

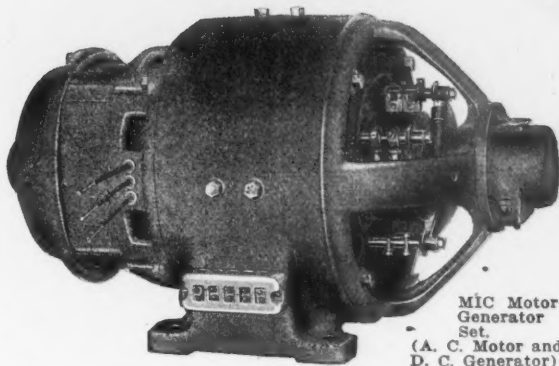
The Guarantee of
Excellence



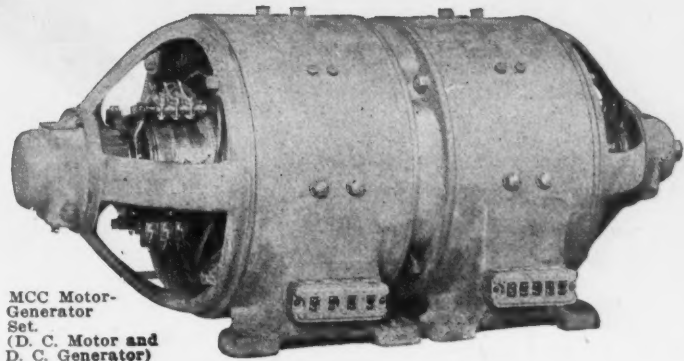
on Goods
Electrical

When Writing to Advertisers, Please Mention Motor Age.

Battery Charging Equipment



MIC Motor-Generator Set.
(A. C. Motor and D. C. Generator)



MCC Motor-Generator Set.
(D. C. Motor and D. C. Generator)

Motor-Generator Sets, Charging Panels and Rheostats

The General Electric Company manufactures different types of battery charging equipment to meet the requirements of all users, from the largest public garage to the small private garage built for a single car.

For the large garage where there are a number of cars to be charged at the same time, one or more motor-generator sets will usually give the best results for the bulk of the work, but rectifiers can be used to good advantage as auxiliaries to take care of cars with exceptionally low or high voltage batteries, and also for long overcharges.

On direct current circuits of 220 volts or higher, motor-generator sets will be most economical in nearly every case whatever the capacity of the garage may be. These sets are furnished in capacities from 1-8 kw. up.

For circuits of 110 to 125 volts, distributing panels with charging rheostats are simple and economical.

For cases where Central Station energy cannot be obtained, we have designed gasoline electric generating sets consisting of a gasoline engine direct connected to a D. C. Generator. The engine and generator are specially designed as parts of the set, making these outfits compact and reliable. These sets are economical and require very little attention.

General Electric Company

Atlanta, Ga.
Baltimore, Md.
Birmingham, Ala.
Boise, Idaho.
Boston, Mass.
Buffalo, N. Y.
Butte, Mont.
Charleston, W. Va.
Charlotte, N. C.
Chattanooga, Tenn.

Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio
Columbus, Ohio
Davenport, Iowa
Dayton, Ohio
Denver, Colo.
Detroit, Mich.
(Office of Agent)
Erie, Pa.

Indianapolis, Ind.
Kansas City, Mo.
Keokuk, Iowa
Knoxville, Tenn.
Los Angeles, Cal.

Largest Electrical Manufacturer in the World
General Office: Schenectady, N. Y.

ADDRESS
NEAREST
OFFICE

Louisville, Ky.
Memphis, Tenn.
Milwaukee, Wis.
Minneapolis, Minn.
Nashville, Tenn.

New Haven, Conn.
New Orleans, La.
New York, N. Y.
Philadelphia, Pa.
Pittsburgh, Pa.
Portland, Ore.
Providence, R. I.
Richmond, Va.
Rochester, N. Y.
Salt Lake City, Utah

San Francisco, Cal.
St. Louis, Mo.
Schenectady, N. Y.
Seattle, Wash.
Spokane, Wash.
Springfield, Mass.
Syracuse, N. Y.
Toledo, Ohio
Youngstown, Ohio

For Texas and Oklahoma business refer to General Electric Company of Texas—Dallas, El Paso, Houston and Oklahoma City

For Canadian business refer to Canadian General Electric Company, L't'd, Toronto, Ont.

3496

The Guarantee of
Excellence



on Goods
Electrical.

When Writing to Advertisers, Please Mention Motor Age.

SCHAFER Ball Bearings

UNIVERSAL
IN USE

SATISFACTION
TO USERS



MANUFACTURERS cannot better introduce their cars to the discriminating public than to say—*they are "SCHAFER equipped."*

The quality of SCHAFER BALL BEARINGS has long been established because of their perfect design, their honest construction, and the high quality of their material.

No matter what conditions they may be subjected to, SCHAFER BALL BEARINGS stand up and give that perfect service which only the highest grade bearings can give.

BARTHEL, DALY & MILLER

42 Broadway, New York City



*The Way They Look
on European Cars*

Rudge Whitworth
DETACHABLE

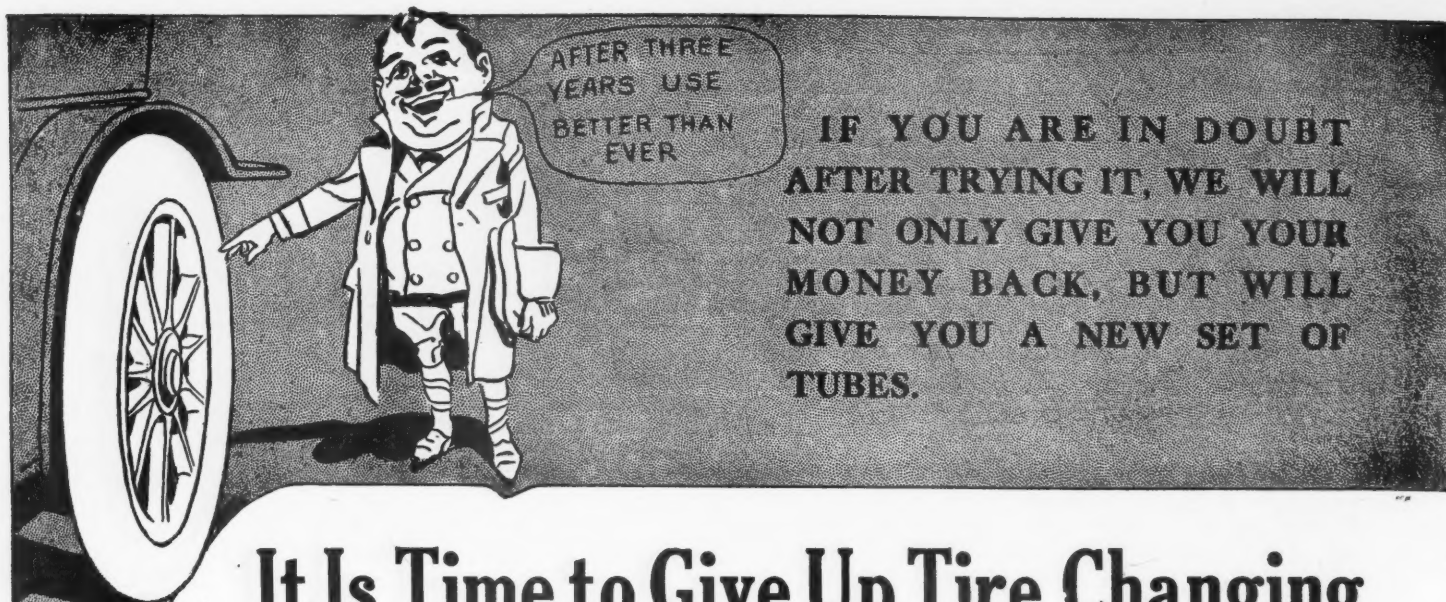
WIRE WHEELS
fitted with
QUICK
HOUK DETACHABLE RIMS

The Right Equipment For Electrics

Rudge Whitworth Wheels lengthen the life of your tires from 50% to 70%.

The Houk Quick Detachable Rim is not only the lightest, but the simplest rim on the market—*not a bolt or nut in its construction.*

GEORGE W. HOUK COMPANY
5002 Lancaster Avenue, Philadelphia, Pa.



IF YOU ARE IN DOUBT
AFTER TRYING IT, WE WILL
NOT ONLY GIVE YOU YOUR
MONEY BACK, BUT WILL
GIVE YOU A NEW SET OF
TUBES.

It Is Time to Give Up Tire Changing

Airease absolutely does away with roadside Tire Repairs!

Motoring to-day would be the great national pleasure if it were not for that ever-present bug-bear—TIRE TROUBLE. The most disagreeable part of motoring is completely eliminated by the use of a tire filler that makes tires as resilient as air, yet as unpuncturable as solid tires.

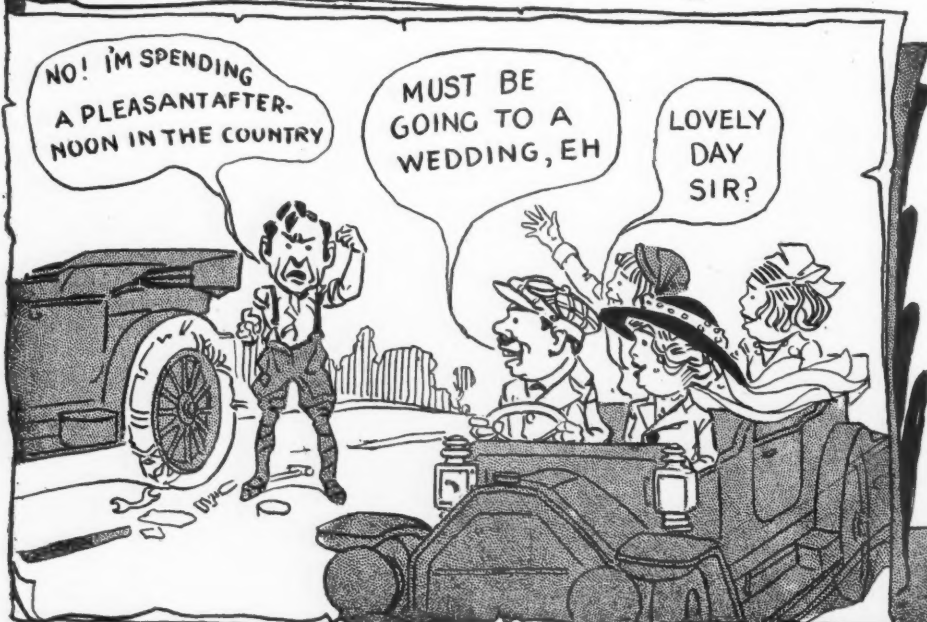
Reflect on some of your past experiences: changing casings in the boiling sun, pumping tires under torrid heat, changing tires at night or in the rain, or going home on the rim—ALL of these are relegated to the region of the old "one-lung" and two-cylinder opposed motors.

WISE MEN MARVEL today at the fact that the old-time bicycle tire, with its troublesome compressed air, could have developed into the automobile tire. Thousands of attempts have been made at spring wheels and airless tires, and not a few tire fillers have been marketed. But it remains for Airease to produce a lasting, unchangable material, not affected by heat or moisture, or cold or drought, that will be as resilient as air and an indestructible element in itself.

Nearly every car owner has said unprintable things about his tires, while dealers and garage men have been besieged with requests for a cheaper and satisfactory substitute for the tire filled with air.

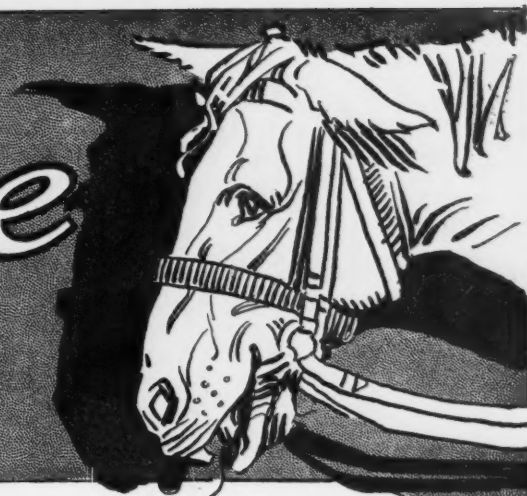
After many years of investigation by a famous chemist, and three years' experimentation and use on many cars, that substitute for air has been developed not only to a marketable state, but to an almost perfect one. In fact, Airease fills all the requirements of the perfect tire filler.

The AIREASERS demonstrating the joys of care-free motoring



**CAN IT BE THAT
THERE IS A MAN
IN THE WORLD**
*who would insist on
using compressed air
in his tires if he were
sure that a perfect
tire filler could be
quickly put in them
which would give all
the resiliency of air
and last for many
years?*

Airease



Solves All Tire Problems

A perfect tire filler must be soft, spongy and resilient—it must neither be affected by heat nor by cold—it must not harden through years of service.

Samples of Airease have been exposed to the air for years—to the July heat and the December cold, but no change has been detected in their bulk or resiliency.

Airease absolutely contains no glue, glycerine, starch, acid, water, or anything else that will shrink or lose its resiliency, or that will disintegrate through years of service.

No matter how many times a tire filled with Airease is compressed, it always springs back with the same resiliency as when new; in fact, if there is any difference it becomes more springy with age. A car can stand in the garage on the same spot for months, yet no noticeable depression can be made upon the tires.

NONE OF MY
ANCESTOR'S
BONES IN THAT
TIRE FILLER

TUBES FILLED WITH AIREASE ARE INTERCHANGEABLE

They can be used in as many casings as you can wear out with your car in years. An Airease filled tube can be inserted into any type of tire or rim.

WE STILL WANT SOME AIREASE REPRESENTATIVES IN DIFFERENT PARTS OF THE UNITED STATES.

The demand for Airease is as by magic. So great and so keen has been the need for a really reliable tire filler that motorists are fairly clamoring for some relief from their pneumatic ills. Already we have hundreds of applications on file for territorial rights in some parts of the country, and we are selecting the best men that we can find to fill the most important stations. 15,000 tires have already been equipped with Airease, and we have never had a dissatisfied customer. Think what that means in your locality!

It costs only a little to establish a filling station in your town or county, and if you are interested in the kind of proposition that will bring unprecedented financial returns, we are anxious to get in touch with you now. Every Airease customer makes another, and another and another. It is marvelous what a furor Airease has created at home without publicity and without any real desire to sell it.

OUR WIDESPREAD ADVERTISING CAMPAIGN HAS BEGUN TO BE FELT.

It is remarkable what advertising can do where the article is much needed and buyers are waiting for it. Our big campaign which has just begun and which, as mapped out, will be the biggest accessory campaign ever followed in the automobile industry, has begun bringing surprising returns. It is only a matter of a few months until Airease will be the most talked-of commodity in the automobile industry, and its sale will eclipse any supply or accessory ever put on the American market.

Airease is backed by a sound financial organization, a group of capitalists who are in no way dependent upon its financial success and whose conservatism has retarded, rather than promoted, the sale of Airease, until every vestige of doubt as to its marvelous value has been swept away by clamoring patrons.

We are now looking for some live representatives who are as reliable as they are progressive. If you are of that type, you should not hesitate writing us today.

We GREATLY REGRET that we appear to be presenting an article in competition with so-called tire fillers that have made a sensational entry into automobile circles, cleaned up and skipped out. We regret that we have to contend with the prejudice against these so-called fillers, yet we beg to assure you that there is as much difference between Airease and glue and glycerine-made tire fillers, as there is between genuine and imitation gems

AIREASE TIRE FILLER COMPANY

Cor. 14th and Pennsylvania Ave., WASHINGTON, D. C.

AIREASE WILL APPEAR HERE NEXT WEEK

568

MARK WITH X PROPOSITION YOU ARE INTERESTED IN

AIREASE TIRE FILLER COMPANY, Washington, D. C.

Gentlemen:

☐ I am interested in tire filling and desire to know the cost of filling my tires. Front size, rear size,

☐ I am interested in Airease. Please furnish me cost of filling plant for this territory.

Name Street City

MA
1-2-12

Here Is the Final Solution of the Electrical Vehicle Tire Problem



Round Tread



Sectional View of Quick Detachable Round Tread



Nobby Tread

United States Special Electric Tires

Guaranteed for 5,000 miles of service and actually show a lower current consumption than any electric tire has ever been known to do before

It is an established fact that the kind of tires used on an electric vehicle exerts an influence of from 20 to 25% on the current consumption.

The ordinary gas car tire is wholly out of place on an electric, which must have a tire as pliable and resilient as it is possible to make it. A stiff tire means not only higher current bills, but also increased battery renewal bills, owing to the frequent recharging it makes necessary.

United States Tire Company experts worked on the electric tire problem for a long time before they finally solved it. Exhaustive tests were carried on in conjunction with several of the largest makers of electric pleasure vehicles in the country. So painstakingly were these tests conducted that some of them were run at 3 o'clock in the morning in order to get the proper temperature in both tires and batteries. Tests were made on city streets, on country roads and on steep hills.

These tests showed conclusively that United States Special Electric Tires gave a higher mileage than any electric tire ever before produced and a lower current consumption, thus effectually combining wearing qualities with current efficiency.

UNITED STATES TIRE COMPANY NEW YORK

RHINELAND BALL BEARINGS

STANDARD
PRODUCT of
THREE COUNTRIES

GERMANY

FRANCE

Especially Adapted for

ELECTRIC PASSENGER AND COMMERCIAL VEHICLES

By their absolute silence and
durability.

Strikes, Fire, Flood or War
Cannot Stop Deliveries

INSURANCE
for BUILDER
and USER

UNITED STATES

RHINELAND MACHINE WORKS CO., 142 West 42nd St., N.Y.

When Writing to Advertisers, Please Mention Motor Age.



"THE • STEADY HAND" HOFFECKER SPEEDOMETER

The manufacturer whose reputation as the maker of a high class car depends on a wise choice of parts and equipment, selects the HOFFECKER SPEEDOMETER as the speed instrument for his latest models.

The HOFFECKER principle, and the HOFFECKER methods of construction have earned for the "Steady Hand" product, the highest place in the Speedometer World.

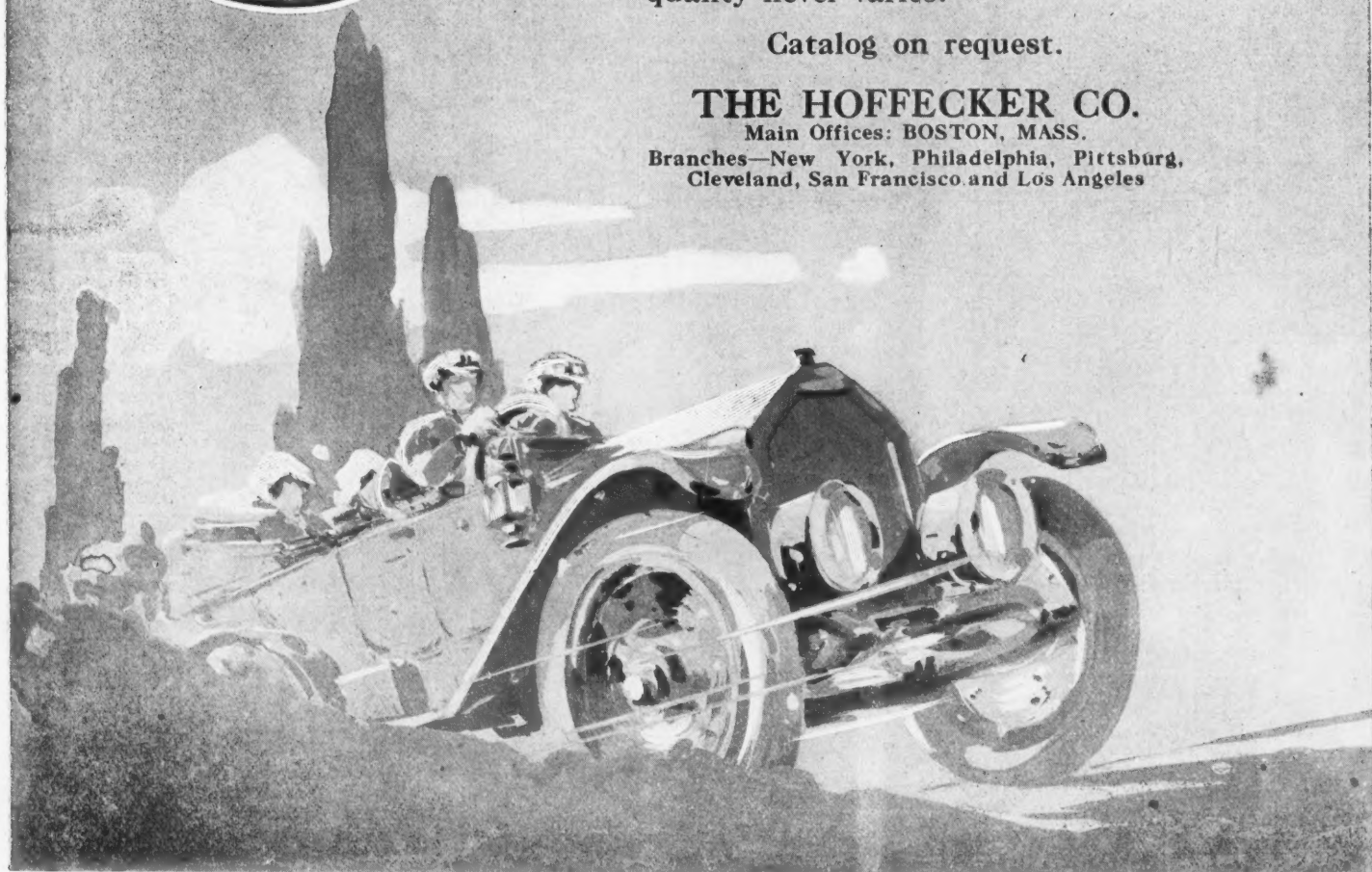
HOFFECKER SPEEDOMETERS are consistent performers and their quality never varies.

Catalog on request.

THE HOFFECKER CO.

Main Offices: BOSTON, MASS.

Branches—New York, Philadelphia, Pittsburg, Cleveland, San Francisco and Los Angeles



"THE JEWELLED"

WALTHAM

✦ TIMEPIECE ✦

WALTHAM eight day timepieces for automobile use, are made according to WALTHAM standards, which means that they represent the highest development of watch manufacture.

It is the only timepiece made for automobiles having 15 jewels, and adjusted to temperature. The movement runs 10 days with one winding, the warning indicator signal giving notice that the movement should be wound three days in advance of its running down. It is an accurate and reliable timepiece, fully warranted. The case affords absolute protection from moisture, dust and theft.

WALTHAM WATCH CO.
WALTHAM MASS.



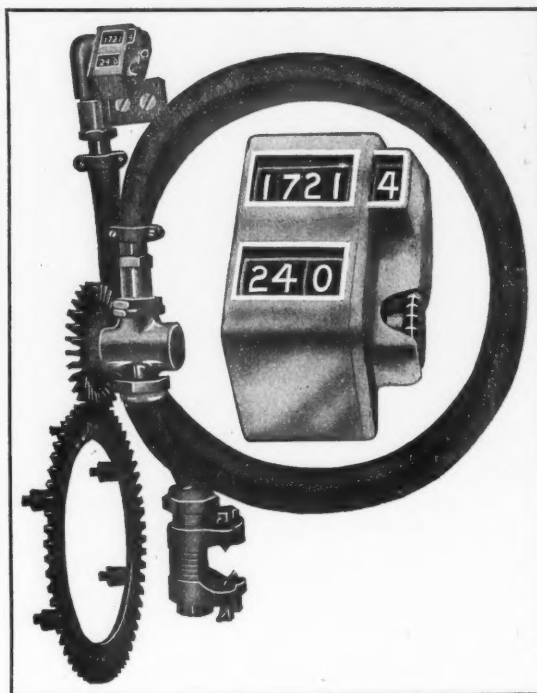
HOW ABOUT YOUR MILEAGE?

The Leading ELECTRIC PASSENGER AUTOMOBILES

have adopted the Veeder Form D trip odometer which is especially suited to this type of VEHICLE.

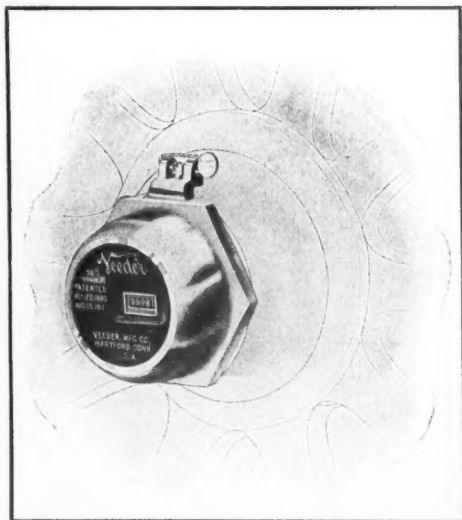
Attached to the dash it is always in sight and at a glance gives you the warning signal when your BATTERY is running low. The trip part of the instrument can be set at zero at any time. Assume, for instance, your battery is good for 80 miles, the trip register at 70 miles warns you that it is about time for a recharge.

This type odometer can also be easily attached anywhere inside the Coupe wherever it is convenient and can be easily read.



**Form D. Trip Odometer for Passenger
Electrics \$20.00**

HOW ABOUT OPERATION COSTS ON BUSINESS ELECTRICS?



**Hub Odometer for Commercial
Cars \$25.00**

Exact cost of electric driven vehicle service can only be secured by a knowledge of exact mileage.

Veeder J-7 Hub Odometers register backward as well as forward and give an infallible reckoning upon which to base the exact cost of operation. They cannot be disconnected by slipping gears out of mesh—your driver can't subtract mileage by running the wheels backward or falsify returns by putting the odometers out of service during a run. Any tampering with the instrument leads to certain detection. It is sealed to the Hub.

Either of the above type of instruments can be secured at your dealers. If not, write us direct. Complete catalogue free.

THE VEEDER MFG. CO.
HARTFORD, CONN., U. S. A.

**Makers of Cyclometers, Odometers, Tachometers,
Tachodometers, Counters and Small Die Castings.**



THE UNITED STATES LIGHT AND HEATING CO.

(Formerly National)

Tests That Prove the U-S-L Storage Battery

Manufacturers say the greatest obstacle they had to overcome in the introduction of battery-driven vehicles was the popular impression that they didn't have *power* or *staying qualities*.

In the process of proof that broke down this prejudice **U-S-L** Storage Battery played an important part. Witness, for example, the photographs on this page, showing **U-S-L** Batteries doing **LOCOMOTIVE SERVICE**. This answers all questions as to power capabilities of the **U-S-L** Storage Battery.

Then came the test of **VOLTAGE DEPENDABILITY**. Here again the **U-S-L** Battery holds a dominating position, for it is a provable fact that the **U-S-L** maintains its voltage capacity up to the very

end of discharge better than any other battery, making it more responsive, livelier, and more dependable on long, heavy runs.

In the matter of **ECONOMY** it has been proved that the **U-S-L** requires for a given energy output the least charging current of all storage batteries.

For **LONG LIFE** the **U-S-L** has proved its worth by frequently giving double the mileage the service in question would ordinarily warrant.

These qualities bring the **U-S-L** up to the highest service standard known to battery engineers. The backing of the strongest battery organization in the world comes to **U-S-L** users through

U-S-L Service

A corps of experts operate from the fully stocked service stations we maintain in eight large cities. These men are at the constant disposal of **U-S-L** customers and co-operate at all times toward the end of maximum efficiency.

Fill out and mail the coupon or write and get valuable information

The U. S. Light & Heating Company

General Offices:

30 Church Street, New York

Factory:

Niagara Falls, N. Y.

Branch Offices and Service Stations:

Chicago

New York

Boston

Cleveland

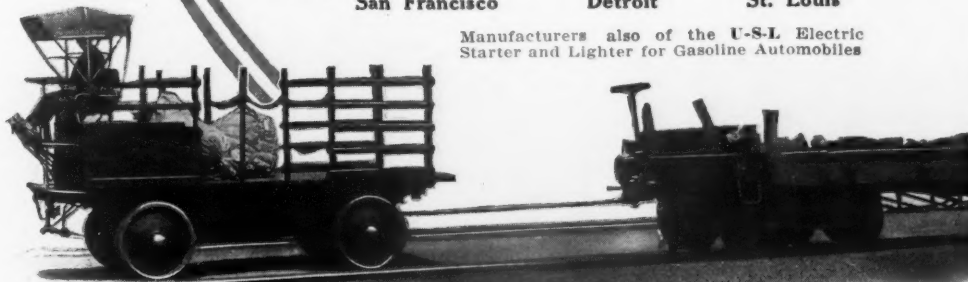
Buffalo

San Francisco

Detroit

St. Louis

Manufacturers also of the **U-S-L** Electric Starter and Lighter for Gasoline Automobiles



The U. S. Light & Heating Company
30 Church St., New York

Gentlemen: Please send me the U-S-L Bulletins checked below:

- ☐ 1. Power for Electric Vehicles—Pleasure and Commercial.
- ☐ 2. Electric Light for Railroad Cars.
- ☐ 3. U-S-L Storage Batteries for Stationary Service.
- ☐ 4. U-S-L Storage Batteries for Independent Electric Lighting.
- ☐ 5. U-S-L Electric Starter and Lighter for Automobiles.

[NOTE—With the bulletins will go forward the U-S-L Book illustrating and describing the U-S-L facilities, service and products.]

Name

Street

City State

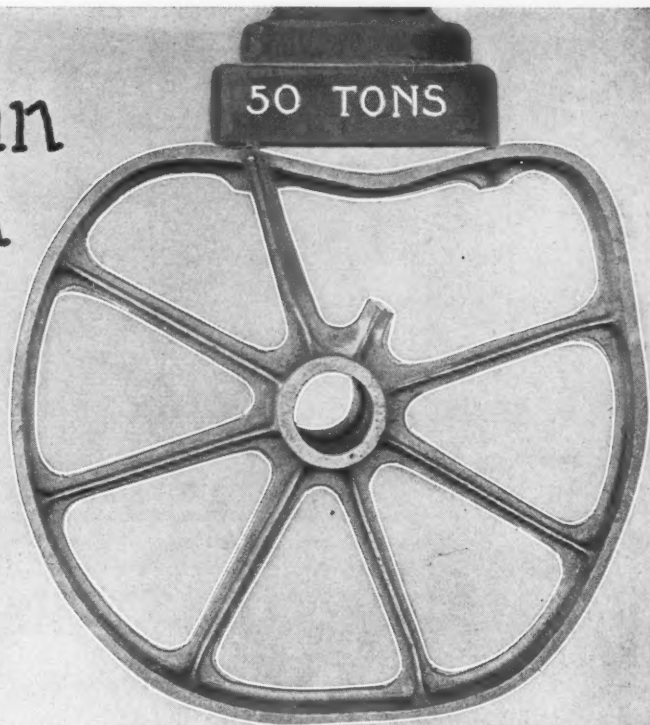
When Writing to Advertisers, Please Mention Motor Age.

Yes they can
be broken

BUT NO BLOW IN
ACTUAL SERVICE
CAN DO IT

SHELDON

STEEL WHEELS

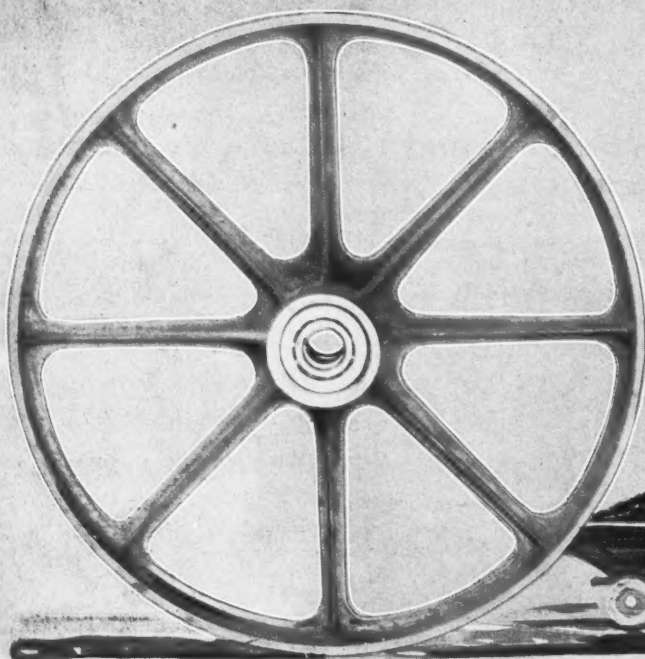


Here is a wheel that weighs less than the wooden wheel, that is positively unbreakable and that will outlast the best twenty cars that ever were manufactured.

The Sheldon steel wheel is the result of years of study of the wheel problem, the concentration of expert effort on improved design, and the most economic methods of construction known to the industry. It is unbreakable under conditions that would smash a wooden wheel to fragments and make a wire wheel unfit for anything but junk. The superior resiliency of the Sheldon steel wheel adds another advantage which the car owner or car manufacturer cannot overlook—tire economy.

This tire economy results from the light weight at the wheel's periphery and the rapidity with which frictional heat radiates from the metal. These are scientific facts which cannot be contradicted and should not be overlooked by any car manufacturer.

The stamp of superiority which has always rested on Sheldon Axles has been put upon the Sheldon steel wheel, which means that no wheel could be better made in any factory.



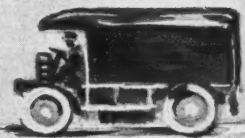
SHELDON AXLE CO.

WILKES-BARRE PA.

CHICAGO BRANCH
DETROIT BRANCH

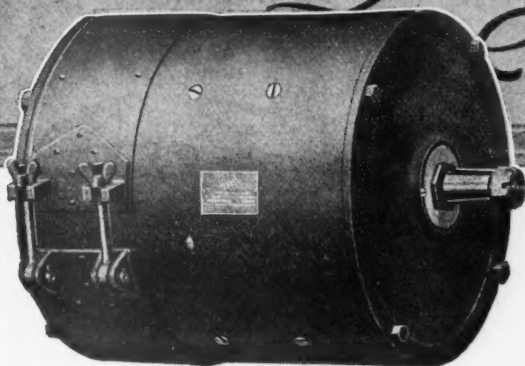
68 E. 12TH ST.
1215 WOODWARD AVE.

THE
WHEEL
OF THE
FUTURE



Diehl Motors and Controls

The One Best System for Electrics



Slow Speed, High Starting Torque,
Noiseless Operation, Long Life

Diehl Electric Vehicle Motors range in size from the smallest unit, for the small pleasure vehicle, to the large unit capable of operating a ten ton truck.

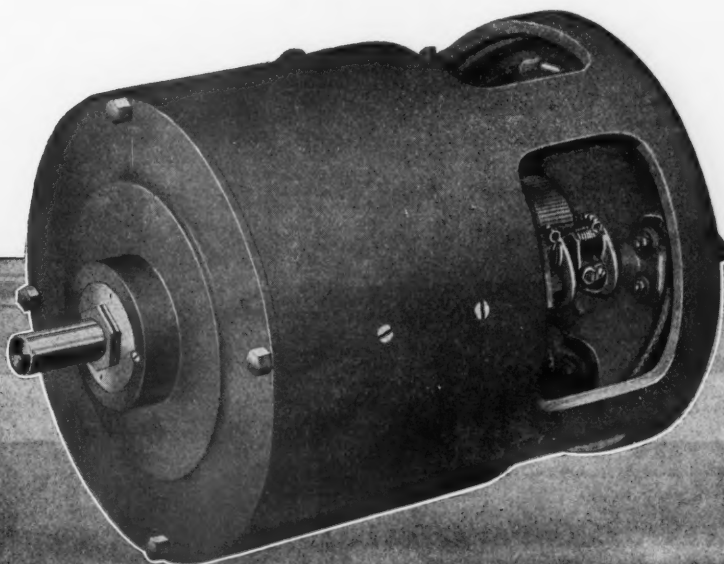
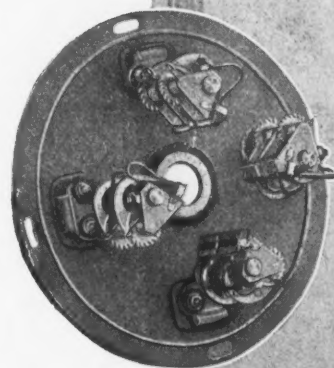
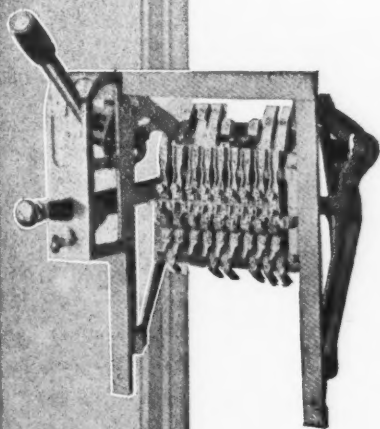
The slow speed features reduce the number of gears, minimizing first cost to manufacturer of vehicles and reducing the number of moving parts in which dirt or grease may collect.

End bonnets and supporting lugs are designed to accommodate the requirements of the manufacturer of the vehicles.

Characteristic curves of motors for special requirements will be furnished upon request.

Send for Bulletin No. 130

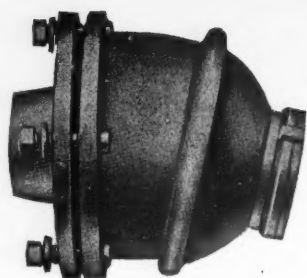
DIEHL MFG. COMPANY
ELIZABETHPORT, N. J.



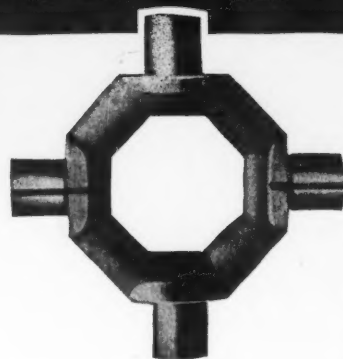
When Writing to Advertisers, Please Mention Motor Age.

Universal Equipment for High Class Cars

Spicer Universal Joints



**OIL TIGHT
DUST PROOF**



"SPICER" Universal Joints are recognized as the Standard for American Cars. There is a reason for SPICER superiority. We have our own Drop Forging Plant and are therefore able to control the quantity of steel in our Drop Forgings. The competent workman and strict inspection standards in our machine department insure a finished product whose accuracy and strength have created the slogan. "SPICER" is Quality.

Spicer Mfg., Co.
Plainfield, N.J., U.S.A.

Introducing a Device of Remarkable Merit



(FRONT VIEW)

THE BOYCE MOTOMETER PAT'S PEND'G

Every sensible owner will buy—
Every live dealer will handle—
Buyers of new cars will request—
And the more progressive manufacturers, for 1913, will regularly equip with—**THE MOTOMETER.**

A watchlike instrument, fitted to any radiator cap, protecting the motor from damage caused by improper lubrication, overheating, defective cooling, etc.

The MOTOMETER is the only instrument ever invented to indicate, while driving, the **exact heat** of your motor, and in so doing warns you by means of a red fluid indicator,

When the Radiator Needs Water

When the Oil Supply Is Insufficient

In short it tells whatever excessive heat tells—a broken water pump, a clogged pipe, a broken fan belt, etc., and tells before the damage is done.

Attached the same as an ornament, readily visible from the seat day or night, the MOTOMETER registers the inside temperature of the radiator. It gives a feeling of security to know when the car is operating correctly—carburetor right, water right, lubrication right, everything right. Nothing can go wrong without the Motometer forewarning.

VIEW FROM SEAT
1/2 Actual Size

The constant rise and fall of the indicating fluid under varying road conditions is more interesting and instructive to watch than a speed indicator. It will prevent frozen radiators in winter and cracked cylinders in summer.

And the Price Is
\$10.

Finished in black enamel with gold plated or nickel rims. If your dealer cannot supply you, send check or money order and we will express an instrument prepaid. Sooner or later you will drive a Motometer equipped car. Why not enjoy it now?

DEALERS—The MOTOMETER is the handsomest and most meritorious accessory offered for 1913, selling at a price that means no dead stock. Act at once! Be the first to handle the MOTOMETER in your town.

The Motometer Company, Inc., 1788 Broadway, New York City

Exhibiting—Madison Square Garden Automobile Show - Space 540, Basement

When Writing to Advertisers, Please Mention Motor Age.

Don't be Satisfied with Half-Way Knowledge of Your Motor-Car

First, get at the fundamentals—the big, construction features that mean strength, safety, speed, power.

Here's one of the big things you ought to know about:

The Power-Transmitting Unit of a Timken-Detroit Rear Axle.

It's shown at the right just as you see it when the body of the car is removed and you look down on the chassis—lower on the page you see it in detail.

Study it—read the description carefully.

It's one of the great Timken contributions to good axle construction.

And it includes the most important single contribution to American motor-car manufacture:—Timken Tapered Roller Bearings.

TIMKEN

BEARINGS & AXLES

In a Timken Rear Axle all the gears—pinion, driving and differential gears—form a unit.

This unit is completely assembled and tested before it is put into the axle.

It is bolted to the front of the housing and is easily removable.

The large removable rear cap of the housing permits convenient inspection and adjustment from the rear.

The quiet running and high efficiency of Timken gears is partly due to this unit construction—proper relation of all parts is assured *before* the axle is assembled.

It is partly due to the grinding of the gears by a special Timken-built machine—the *one gear-grinding machine made* that corrects all the microscopic inaccuracies left by even the finest gear cutters.

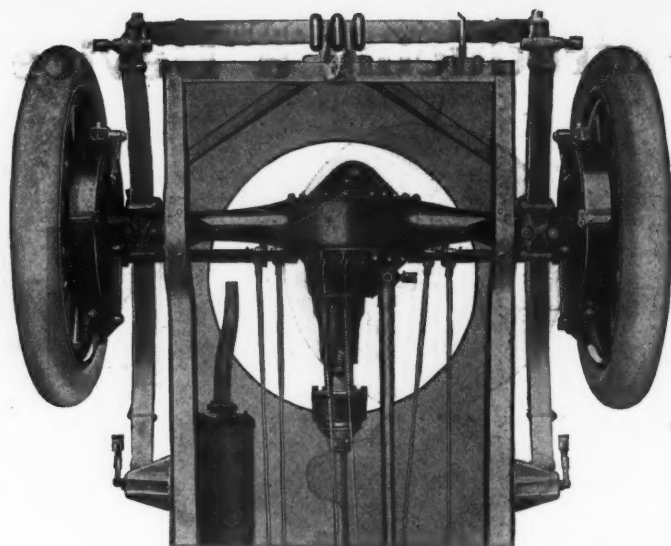
It is lastly and largely due to the Perfect Service given by Timken Tapered Roller Bearings.

The Power-Transmitting Unit is carried by these bearings.

They keep shafts in line and gears accurately in mesh, *saving power* and insuring quiet running.

They do this because of three great principles of Timken Tapered Roller Bearing construction.

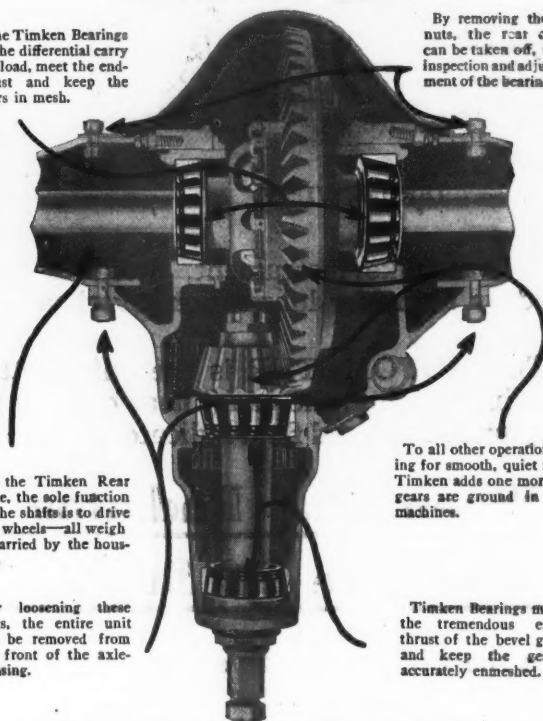
1. A greater load capacity than balls because they carry the load along their whole length instead of on points only.
2. Greater ability to meet force from the end as well as the side—because the rollers are tapered.
3. Perfect adjustability for wear—due to the tapered construction.



Above is a picture of a Timken-Detroit Rear Axle, showing the position of the Power-Transmitting Unit illustrated in detail below.

The Timken Bearings on the differential carry the load, meet the end-thrust and keep the gears in mesh.

By removing these nuts, the rear cap can be taken off, for inspection and adjustment of the bearings.



In the Timken Rear Axle, the sole function of the shafts is to drive the wheels—all weight is carried by the housing.

By loosening these bolts, the entire unit can be removed from the front of the axle-housing.

To all other operations making for smooth, quiet running Timken adds one more—the gears are ground in special machines.

Timken Bearings meet the tremendous end-thrust of the bevel gear and keep the gears accurately enmeshed.

Good Axle Construction Demands Human Integrity and Efficiency

It isn't merely one, or even all of its notable features that makes the Timken-Detroit Rear Axle.

It's really the human equation back of the whole.

An organization that began before the motor-car industry was dreamed of.

That for years has been devoted exclusively to building motor-car axles—and to nothing else.

Whose product represents the whole sum—not a part—of motor-car axle knowledge and experience; American and European.

The Timken story requires many chapters—this advertisement is only one.

Look for the others and read them—they will give you a new understanding of the modern motor-car.

You can get the whole story of axle and bearing importance and construction by writing to either address below for the Timken Primers, T-9 "On the Care and Character of Bearings," and T-10 "On the Anatomy of Automobile Axles."



THE TIMKEN-DETROIT AXLE CO., DETROIT, MICH.
THE TIMKEN ROLLER BEARING CO., CANTON, OHIO



When Writing to Advertisers, Please Mention Motor Age.

The Wells Generator Lights the Way

**Electric Light Your 1913 Car
With Energy Your Engine
Now Wastes**

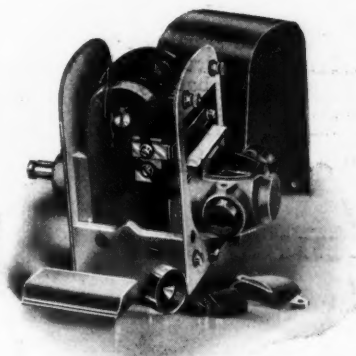
Every up-to-date 1913 car will be electric lighted. The question, then, is not **whether** an Electric Lighting System, but **what** Electric Lighting System. In an important issue of this kind, motor-wise manufacturers and car owners cannot afford to experiment.

There is Electric Lighting insurance for the life of your car in

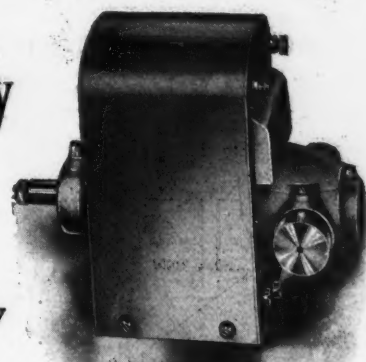
The Wells Electric Lighting System

The WELLS ELECTRIC LIGHTING GENERATOR stores and delivers current for the complete lighting of the automobile. Its power is derived from energy now being wasted by your motor. It operates with equal effectiveness at all speeds. It has the capacity required to keep the battery charged so as to furnish sufficient light when the car is not running.

When the lights are turned on, the Generator supplies the current direct, and in case the amount furnished is in excess of the current consumption of the lamps, the current will be stored in the battery.



**An Electric
Generator
That
Automatically
Regulates
Itself**



The current production is at all times automatically regulated—there is no altering of the light under high or low speeds. A magnet shunt prevents any damage being done to the battery when the lights are off.

The WELLS GENERATOR is compact and absolutely simple. It cannot be thrown out of adjustment, as there is nothing to get out of order. There are no special windings or complicated regulating devices such as friction drives, etc., in its construction. The generator is fully enclosed; there are no openings whatever to draw in grit and dust. The scheme of wiring is simple, convenient and economical to install. **The device will last as long as the car itself.**

Put **your** car in the 1913 class by seeing to it that it is Electric Lighted with an economical, trouble-proof, fool-proof WELLS GENERATOR.

Write for Prices and Details in Full

R. C. WELLS MFG. COMPANY
Wells Building Fond du Lac, Wis.

Westinghouse Electric Starting, Lighting and Ignition

THE electrical starting, lighting, and ignition systems on a number of the finest and best known cars this year will be Westinghouse built.

To be able to supply cars with electrical equipment that is backed by the experience of a long established electrical manufacturer with large facilities like the Westinghouse Company has been the desire of every leading automobile manufacturer, and Westinghouse equipment will be one of the strong talking points of the new models.

Take a hint from the judgment of the manufacturers of these cars and see that the machine you purchase has Westinghouse equipment.

THE equipments include: starting motors; lighting generators; combined lighting and ignition generators; and combined lighting and starting units; all standardized for different types of cars. All equipments are 6-volt systems.

Lighting and Charging

Westinghouse automobile generators automatically charge the battery without the use of any relays or solenoid-operated regulators. There are no adjustments to be made. The battery is at no time charged at an excessive rate.

The generator is slow speed, eliminating noise and wear.

Ignition

A high-power single-unit spark coil, acting in conjunction with timing and distributing parts on the generator, furnishes high voltage for the spark. The battery operating alone or with the generator supplies continuous power. The interrupter gives *automatic spark advance*. The spark is uniform, regardless of speed.

Starting

Minimum weight of motor and minimum discharge of the battery are features of the Westinghouse starting motors, permitting the use of a smaller battery and smaller charging generator.

A Westinghouse starting motor therefore means less weight to carry and fewer battery renewals.

Every Westinghouse Equipment is backed by the Westinghouse Guarantee

Westinghouse Electric Manufacturing Co.

East Pittsburgh, Pa.



Visible Gap Spark Plug Tells Its Own Story

Through the window in the porcelain of the plug—**outside** the motor—you can instantly tell if the plug is firing correctly. You can see the spark jump the gap in the central electrode at any time—the darkest night shows it up clearest.

It simplifies the trouble hunt by half.

If there is a spark in the window, but proper ignition fails, you know the points are fouled. In that case, just turn the knurled micrometer nut at the top of the plug with the fingers and separate the visible points still more. This increases the intensity of the spark, breaks down all oil or carbon deposits between the points and automatically cleans them in a jiffy.

And if there is no spark in the window, you know you must look to coil, batteries or magneto for your trouble.

You don't have to take the J. D. Plug out of the motor.

By this micrometer nut you can adjust each plug so as to give maximum sparking efficiency.

One glance through the window tells all.

You need a set of these plugs in your motor. Send for a set now, enclosing price and size wanted (or tell make of car), and we will forward them at once, prepaid. Our rigid guarantee of positive satisfaction or your money back goes with every plug.

You are the judge in this trial.

We make millions of spark plugs a year—that's our only business. We import our clays for our heat-defying porcelain, and use the best material on the market.

Yet the price of the J. D. Visible Gap Spark Plug is only \$1.00.

Perhaps you would like our free book on Ignition. It contains a mine of useful information. A card brings it.

JEFFERY-DEWITT COMPANY

551 BUTLER AVENUE

DETROIT, MICHIGAN

Largest Manufacturers of Spark Plugs in the World



Model B Speedometer
with Grade In-
dicator . . . \$50

Model B-1 Speedometer with
Grade Indicator and
Clock \$85

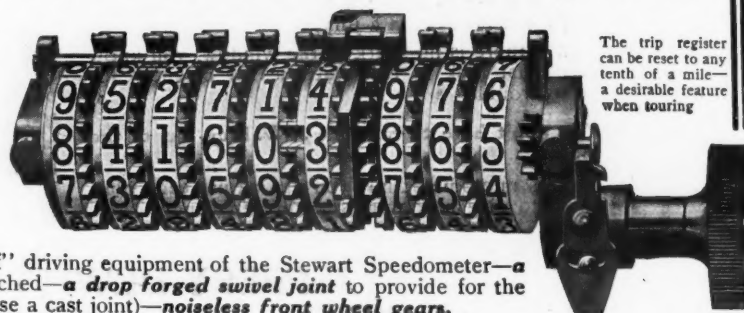
Out of 158 Car Makers who have selected the magnetic type of speedometer for equipment on their cars, 134 have selected the Stewart Speedometer.

The Selection of the Stewart Speedometer by this great majority of car makers signifies only one thing—that the *Stewart Speedometer is an instrument of superior merit.* Think what this means! The Stewart Speedometer is the almost unanimous selection of car makers—*men who are especially competent to judge of the merit of a speedometer*—inventors, designers and manufacturers of fine mechanism themselves. Even if you didn't know that the Stewart Speedometer is a magnificent instrument—strong, lasting, accurate, beautiful—you could safely rely upon the judgment of 134 car makers out of 158.

Therefore, if you desire permanent satisfaction insist on getting the New 1913 Stewart Speedometer with Grade Indicator when buying a car. The chances are that the car of your choice will bear the Stewart Speedometer as standard equipment *because over eighty per cent of the total output—ALL MAKES—for 1913 will bear the Stewart Speedometer as standard or special equipment.* *Even if the car you select is not so equipped you can get the Stewart Speedometer if you insist.* The maker or dealer will gladly and quickly put one on—all you will have to do is to say: "I want the New 1913 Stewart Speedometer with Grade Indicator on my car."

And you can rest assured that you will be right because you will have the trained judgment of one hundred and thirty-four car makers to back you in your choice.

A Real Automobile Odometer. This Big, Sturdy Distance Recorder is Combined with the Stewart Speedometer



The trip register can be reset to any tenth of a mile—a desirable feature when touring

The Grade Indicator

(At Top of Speedometer Dial)

The Grade Indicator is an accurate instrument operated automatically by gravity. Made strong and dependable, it is as unfailing as the power which operates it. It tells the exact truth about grades. It shows the various degrees of grades from zero up to thirty—the big, easily read numbers being carried on a revolving cylinder which presents the proper figure at the opening of the speedometer dial.

Note its big, honest figures—its sturdy frame—and strong brass cylinders—that means real "instrument" construction. Note that it is an expensively made *automobile* odometer—not a cheap *bicycle* odometer. Every turn of the front wheel is registered because its brass cylinders are revolved by a *direct drive mechanism*. It cannot lie because it contains no springs to break or weaken—no pawls to slip or fail. Hard bronze gears—solid brass cylinders—direct drive mechanism—positive action—service everlasting.

Don't forget the strong, unbreakable, "trouble-proof" driving equipment of the Stewart Speedometer—a *flexible shaft* that will outlast the car to which it is attached—a *drop forged swivel joint* to provide for the movement of the front wheel in turning corners (others use a cast joint)—*noiseless front wheel gears.*

You can get the New 1913 Stewart Speedometer with Grade Indicator on any make of car if you insist.

SEND FOR CATALOG
Stewart & Clark Manufacturing Company
1931 Diversey Boulevard, Chicago

BRANCHES—Detroit Chicago San Francisco New York Boston Cleveland
Philadelphia Kansas City Los Angeles Minneapolis Indianapolis London Paris

The Grade Indicator cannot be obtained with any other make of speedometer. It is combined only with the Stewart.

When Writing to Advertisers, Please Mention Motor Age.

The Atwater Kent Ignition System

is not only distinctive from other ignition equipment in name, but it is advantageously different from all others in many respects.

Other ignition equipment have the distinction without the difference.

The Atwater Kent System is different in embodying the best features of both magneto and battery. In fact, it gives magneto results with a battery system, without the weaknesses of either, at less than one-half the cost of a good magneto.

It is ideal for use in connection with lighting and starting equipment, as it produces a hot dynamic spark, perfectly timed, regardless of the engine speed.

Just a few of the many good features of the Atwater Kent System are—

Its simplicity of mechanism—no vibrators, relays or commutator—just one contact point regardless of the number of cylinders and only three moving parts, none of which is subject to excessive wear.

Its single adjustment easily and quickly made and seldom requiring attention.

Its adaptability and easy installation on any standard make of motor, new or old.

There are now two types of Atwater Kent Ignition equipment—standard Type F and the new Type K—



the latter having the automatic spark control and insulated primary circuit features.

Prices of the Type F System

	Standard Coil.	Kick Switch Coil.
1-cylinder	\$17.00	.....
2-cylinder opposed	18.00	.....
2-cylinder distributor type...	22.00	\$24.00
3-cylinder distributor type...	25.00	27.00
4-cylinder distributor type...	25.00	27.00
6-cylinder distributor type...	27.00	29.00

Prices of the Type K System

	Standard Coil.	Kick Switch Coil.
2-cylinder	\$32.00	\$35.00
3-cylinder	35.00	38.00
4-cylinder	35.00	38.00
6-cylinder	37.00	40.00

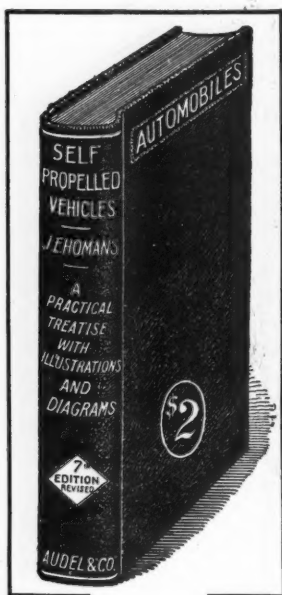
In substituting the Atwater Kent System for the magneto, or for driving it from any horizontal shaft or gear, we furnish a special magneto gear mounting, the additional price of which is \$5.00.

Perhaps your present car needs only an Atwater-Kent—"the different" system of ignition to enable it to give you perfect service. Anyhow you should have a copy of our booklet A, it's interesting and it's free.

ATWATER KENT MFG. WORKS

4934 Stenton Ave.

Philadelphia, Pa.



SELF-PROPELLED VEHICLES. By James E. Homans, A. M. A practical treatise on the theory, construction, operation, care and management of all forms of automobiles, with upwards of 500 illustrations and diagrams, giving the essential details of construction and many important points on the successful operation of the various types of motor carriages driven by steam, gasoline and electricity. This is probably the best comprehensive treatise published in simple language, so that the contents may be readily understood by the intelligent reader, especially if he has a machine to which he can refer for demonstration of many points discussed. For one who desires to understand automobiles, it is an excellent work to begin with before going deeper into the subject along highly specialized lines. Size, $5\frac{1}{2} \times 8\frac{1}{2}$. Pages, 652. With drawings and half-tones.

OF ALL THE BOOKS published relative to the automobile industry, the two illustrated and described on this page have proved deservedly popular and among the best sellers.

They cover the subject thoroughly, are well illustrated and printed in good readable type. The price of each volume is \$2.00, and is sent postpaid at that price.

Address the Class Journal Co., 910 S. Michigan Avenue, Chicago.

GAS ENGINE MANUAL. This volume, just published, gives the latest and most helpful information respecting the construction, care, and management of Gas, Gasoline, and Oil Engines, Marine Motors, and Automobile Engines, including chapters on Producer Gas Plants and the Alcohol Motor. Each chapter is illustrated by diagrams which make it a thoroughly helpful volume, containing 512 pages, 156 drawings, printed in large, clear type on fine paper, handsomely bound in rich red cloth, with gold top and title, measuring $5\frac{1}{2} \times 8\frac{1}{2}$ inches and weighing over two pounds. The book is a practical educator from cover to cover and is worth many times the price to any one using a gas engine of any type or size.

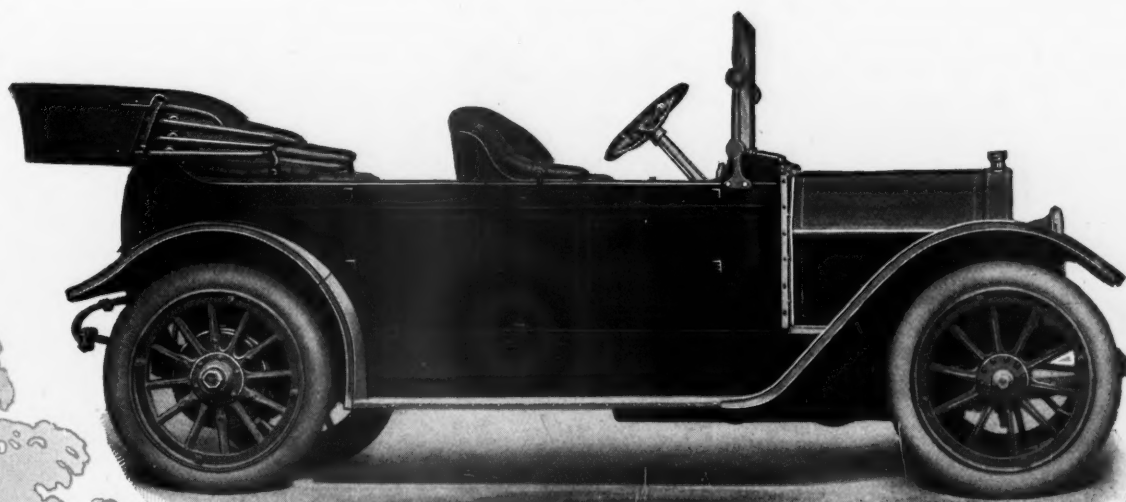


You can't afford to overlook the

HAYNES

in selecting your line for 1913

This new
Model 24, \$1785



**Left Side Drive—Center Control
Electric Starting and Electric Lighting**

puts every Haynes dealer on the offensive and beyond competition, even in these strenuous days in the automobile business.

**That's why it's more than ever to your
interest to consider the Haynes NOW**

Consider first what a magnificent car this is, backed by Haynes merit, satisfaction, tradition and service



Front View Model 24



HIS NEW MODEL is worthy of the name Haynes—if it were not, we would not offer it. The new low price doesn't mean that Haynes standards have been cut.

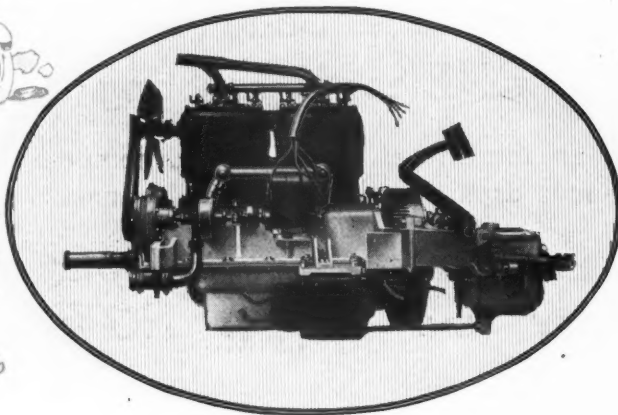
There are some noteworthy departures from former Haynes construction in Model 24—all designed for greater efficiency. Model 24 has left side drive—in step with the designs of the latest models in nearly all high grade cars—and a center control, which is especially convenient.

The new car has the same electric starting and electric lighting system we adopted for Model 22 six months ago—the type of electric starting and lighting equipment which has since become the standard for first class cars.

Furthermore, it has the famous Haynes contracting steel band clutch—Haynes transmission, spring suspension, lubrication system and a sturdy, flexible power-unit support.

Model 24 is a big car—118 inch wheel base—it has wide, roomy seats with upholstery 12 inches deep, covered with finest hand-buffed leather.

Left Side View—Haynes Motor Model 24



This Haynes for \$1785 means a broader field for every Haynes dealer. It places a Haynes car in reach of thousands of buyers who have long wanted a car at this price, backed by such standards of merit and service as have kept the Haynes—America's first car—always its foremost.

Haynes Model 24 is a new Standard in the \$1800 class. It means big sales for Haynes dealers



HAYNES CAR at \$1,785 is made possible only by the efficiency of the Haynes plant, by its use of only the latest and most approved methods of automobile construction—it is the culmination of twenty years' experience in automobile building.

The standards which have made the Haynes pace-maker most of the time—and have kept it up with the leaders all the time—are new standards in a car selling for less than \$1800. There's no room for argument on this point.

The buying public knows what Haynes standards mean—it knows that Haynes reputation was not built on catch-phrases in advertising. The best advertising the Haynes has had, and is having, is the unqualified satisfaction of Haynes owners everywhere. This satisfaction of Haynes owners is the greatest assurance Haynes dealers have of a successful future.

Specifications

Read carefully what the Haynes Model 24 offers. Bear in mind that Haynes character stands behind these specifications. And ask yourself what demand there is today for such a car at such a price.

Frame—Pressed steel 4" deep, double drop.

Wheel Base—118 inches.

Motor—4½ inches bore by 5½ inches stroke. L-head cylinders cast in pairs, offset ½ inch. Flexible 4-point suspension.

Ignition—Dual type magneto.

Carburetion—Stromberg Model B Special.

Lubrication—Splash and force feed, oil reservoir in lower half of crank case and filled through feather pipe on side of crank case.

Control—Steering wheel on left side—Center control.

Steering Column—Worm gear type, corrugated rim, aluminum spider, 18-inch wheel.

Clutch—Haynes contracting steel band on hardened steel drum. Supported by crank shaft. Easily adjusted and lubricated.

Transmission—Selective type, three speeds forward, one reverse. Roller bearings. Operated through H-slotted bracket, center control. Supported from two rear arms on engine base.

Propeller Shaft—Forged. Two universal joints, metal enclosed and packed with hard grease.

Rear Axle—Full floating type, pressed steel housing, supporting full weight of car. Shaft, nickel steel.

Front Axle—Single piece I-beam, drop-forged. Spring seats forged integral. Roller bearings.

Wheels—Artillery type, wood, twelve spokes front and rear. Bossed spokes alternating in rear wheels. Demountable rims.

Tires—34x4, front and rear.

Springs—Front, semi-elliptic, 40 inches long, 2 inches wide, 7 leaves; rear, three-quarter elliptic, 48 inches long, 2 inches wide, 7 leaves. Fitted with grease cups both front and rear.

Brakes—Internal and external on rear wheels. Drum 14x2½-inch face. Disappearing foot pedal operates external service brakes, and lever on right of driver's seat operates internal emergency brakes.

Body—Sheet metal, fore door. Black, hand buffed upholstery, spring backs to both seats filled with super extra curled hair.

Colors—Body black. Wheels black, same as body. Special colors to order. All metal equipment black enamel and nickel.

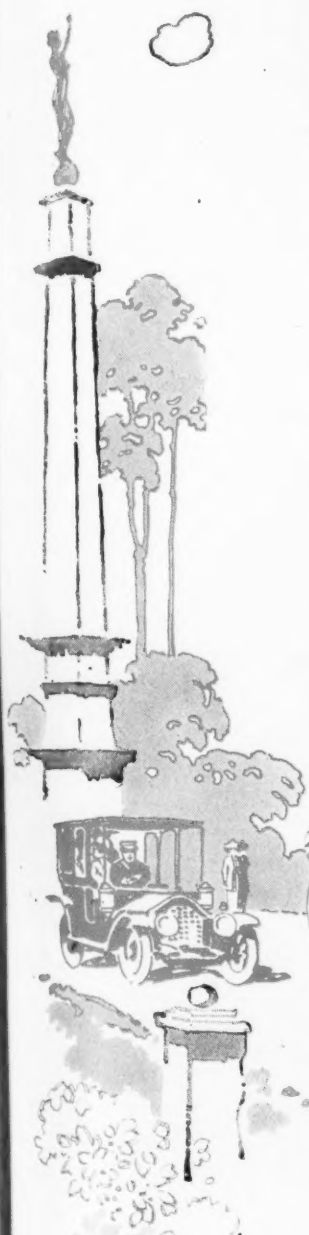
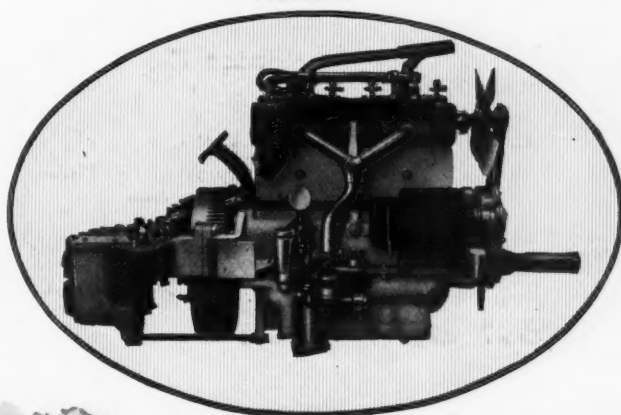
Gasoline Tank—18 gallons capacity.

Road Clearance—10 inches.

Equipment

Top, top cover, two large electric head lights, glass front, electric side lights, flush in dash, electric cowl lamp, electric starter, generator, 100 ampere hour storage battery, speedometer, horn, coat and foot rails, tire irons, full equipment tools, etc., also one extra demountable rim.

Right Side View—Haynes Motor Model 24



The Big Haynes, Model 22—The Complete Car—which has met with success everywhere, is continued as a Haynes Leader



The big Model 22, full 40-horse power, marks the highest development of the Haynes Car. It is in every way The Complete Car—durable and dependable, comfortable and handsome, powerful and quiet—everything a car should be. It is the very maximum of automobile efficiency at the very minimum of cost.

Model 22, Detail Specifications

Motor, $4\frac{1}{2}$ in. x $5\frac{1}{2}$ in., 40 h. p.; wheel base 120 in.; fine hair upholstery, 12 in. deep; tires $36 \times 4\frac{1}{2}$ in.; absolutely 100% efficient electric starting equipment of utmost simplicity; Eisemann dual magneto, Stromberg carburetor, Warner autometer, demountable rims, top, windshield, electric signal horn, electric cowl lamp, standard bumper, etc., etc. Touring car models \$2250; Roadster \$2250; Coupe \$2750; Limousine \$3400; Berlin \$3500; f. o. b. factory.

See these Haynes Cars at the Shows

Space 114, Madison Square Garden, New York

Space C-5, Coliseum, Chicago

But, if your territory is still open for a Haynes Agency, don't wait until the shows. Write or wire us today. There is no better proposition for 1913.

Haynes Automobile Company

501 Union Street

Kokomo, Indiana



SCIENCE

Supports our Claims

The WARD LEONARD SYSTEM

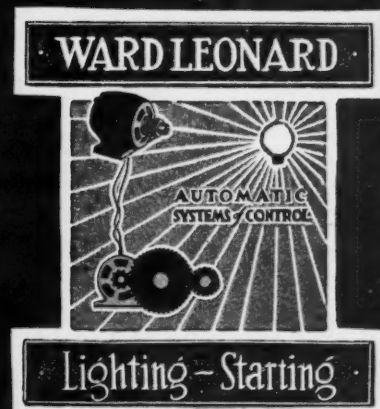
The Ward Leonard automatic dynamo lighting and starting system of to-day is fundamentally and scientifically correct. It is perfect both mechanically and electrically.

What the electrical engineers knew to be right and standard, we used in our systems. What they did not know, we showed them, and today the Ward Leonard Lighting and Starting System has the approval of experts, the support of science and the commendation of users.

Our lighting and starting system is automatically perfect, is simple, light in weight and *it does not go wrong.*

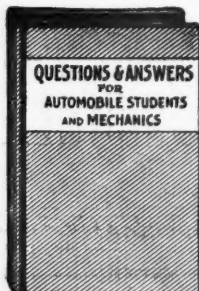
WARD LEONARD ELECTRIC CO.
BRONXVILLE, N. Y.

103



ANY BOOK ON THIS PAGE SENT FOR \$1.50 PREPAID

Questions and Answers



For Automobile Students and Mechanics

By THOMAS H. RUSSELL.
A book of 600 Questions and Answers, adapted for teaching School, the Machinestop or before the Board of Examining Engineers. This is the largest, the latest and most authentic book of its kind upon the market. Prepared especially for Home Study. 150 pages. Bound in flexible covers—In fact it is a regular text book.

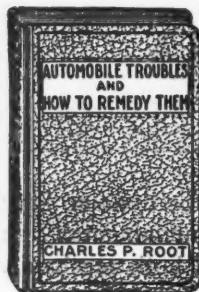
Automobile Troubles and How To Remedy Them

By CHARLES P. ROOT, Former Editor "Motor Age."

Pocket size—5 x 7 inches, 225 pages, illustrated, handsomely bound in red flexible leather, round corners, red edges. The only book of its kind published. It not only tells you how to locate troubles and make repairs, but shows you.

CONTENTS

Back or too early firing (preignition)—Blow-back of gas into carburetor—Popping noises—Buzz in coil (other than contact breaker buzz)—Misfires—Smells—Stoppage of engine—Batteries—Bearings—Blakes—Carburetor—Change speed gear—Clutch—Coil—Connecting rod or crank shaft broken—Gear—Governor—Ignition—Lubrication—Misfires—Muffler troubles—Overheating—Piston troubles—Popping in carburetor—Spark plug—Steering—Timing—Tires—Valves—Valve springs, and numerous other troubles.



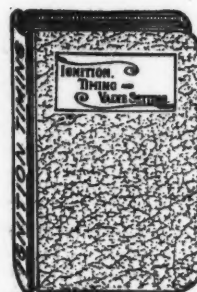
Ignition, Timing and Valve Setting

By THOMAS H. RUSSELL, A.M., M.E.

Pocket size, 225 pages, fully illustrated, Red Flexible Leather Binding, round corners, red edges. A comprehensive illustrated Manual of self-instruction for Automobile Owners, Operators and Repairmen.

CONTENTS

Electrical Ignition for Motor Car Engines—The battery and coil system—The Magneto System—Low tension and high tension methods—Magneto Ignition—General Summary of Ignition—Ignition Faults and Hints—Induction Coils, Timing Ignition—Valves and their Functions—Valve Setting—Useful Hints, etc.



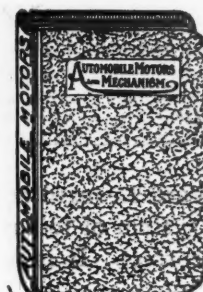
Automobile Motors and Mechanism

By Thomas H. Russell, A.M., M.E.

Pocket size, 265 pages, red flexible leather, round corners, red edges, fully illustrated.

CONTENTS

The Internal Combustion Engine—Production of the fuel mixture—Function of the carburetor—The cycle of operations—Cylinders, piston and rings—Shaft and bearings—Ignition apparatus—Single and multi-cylinder engines—The two-cycle engine—Silencing the exhaust—Detailed description of construction—Governors and governors—The centrifugal governors—Carburetors—The float-feed principle—Various types of modern construction—Flooding the carburetor—Carburetor troubles and adjustments, etc.—Transmission Mechanism—Home-made automobile for \$25—Three-wheeled motor car, etc., etc.



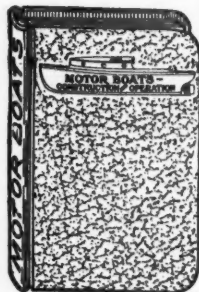
Motor Boats: Construction and Operation

By THOMAS H. RUSSELL, A.M., M.E.

Pocket size, 300 pages, fully illustrated, flexible leather, round corners, red edges. A manual for motor boat and yacht owners and all users of marine gasoline engines.

CONTENTS

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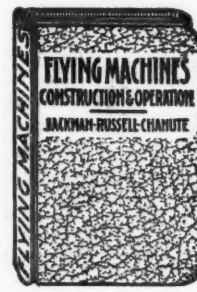
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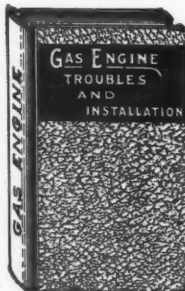
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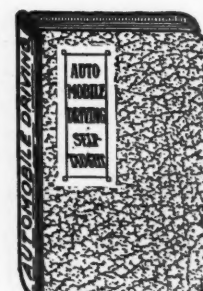
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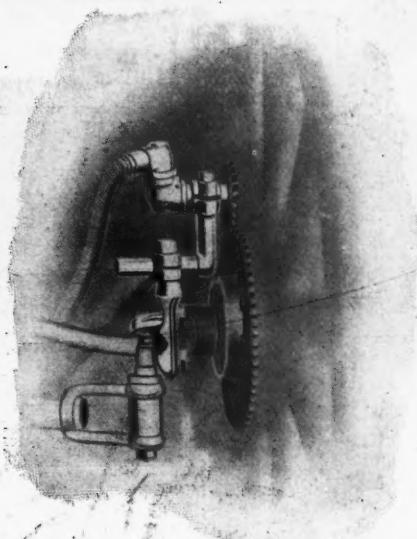
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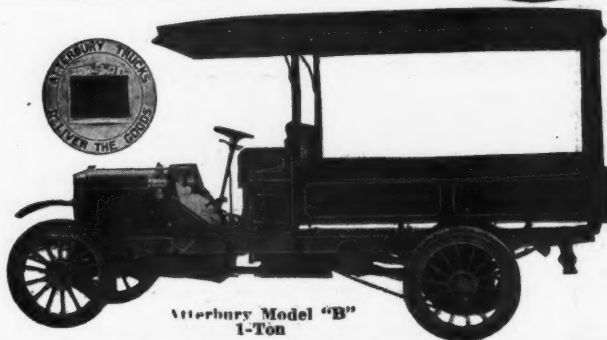
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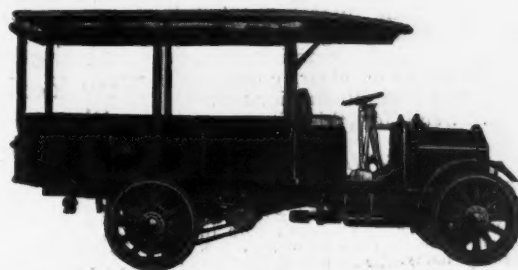
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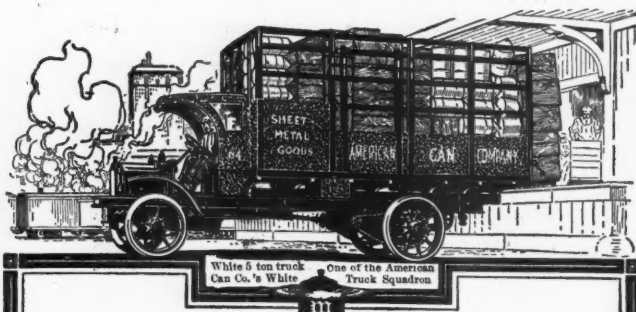
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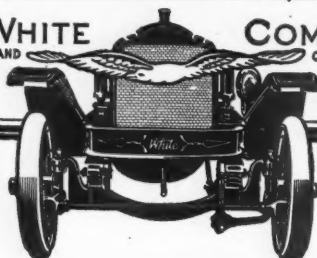
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
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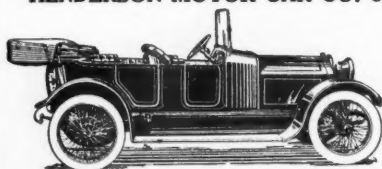
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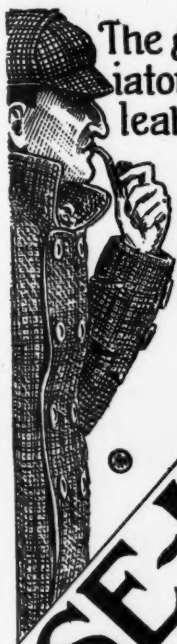
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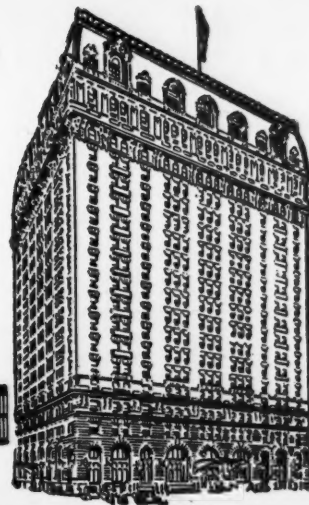
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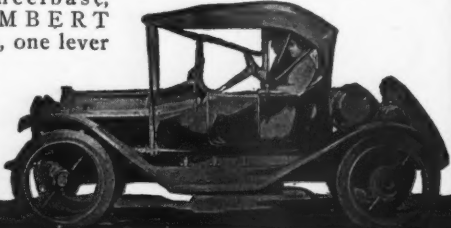
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¶ The first American Car to adopt the Knight Type Motor — The Engine used by Daimler, Mercedes, Panhard and Minerva.

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TIRE PUMP

Made by Bridgeport Brass Co.

Distinctly Better

Than any other pump. Has seamless brass tube cylinder, non-leakable joints, automatic valve and heavy cast base. A guaranteed tire pressure gauge if you want it.

Price without gauge, \$4.00 With gauge, \$6.00

BRIDGEPORT BRASS CO.
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Knight Tires

Give Full Value For Every Cent Paid

Knight tires are sold at a price based on the character of the material used and the labor employed to make them. They wear longer than other tires and give greater riding comfort.

You get what you pay for when you buy Knight tires. Write today for descriptive literature.

THE KNIGHT TIRE & RUBBER COMPANY
CANTON, OHIO



LAUTH-JUERGENS

**One, Two, Three and
=Five Ton Trucks=**

"Guaranteed for Life"
"Guaranteed Service"

The Lauth-Juergens Motor Car Company, Fremont, Ohio

Write For This Franklin Dealer Proposition

Franklin Dealer Proposition

FRANKLIN six-cylinder models now equipped with Entz Electric Starting and Lighting. A real self starter with original features. Franklin cars use less gasoline, less oil, no smoke, fewer tires, travels faster, rides easier, silent, powerful, flexible, beautiful. Get the Proposition.

Franklin Automobile Co., 27 Franklin Sq., Syracuse, N.Y.



GRAY & DAVIS

NOTE COMPACT CONSTRUCTION OF DYNAMO AND COMPARATIVE SIZE

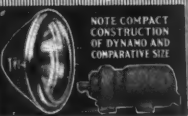
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Lights your lamps (without battery connection), charges your batteries, operates power-horn, inspection lamp, etc. A complete system—not a makeshift.

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Are supplanting oil and gas lamps wherever automobiles are used. Gray & Davis 6 Volt Electric Starter, Electric Lamps and Dynamo are Standard Equipment on America's leading cars.

GRAY & DAVIS, Inc., 55 Lansdowne St., Boston, Mass.
Manufacturers of Automobile Lamps, Dynamos and Electric Starters



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The Inter-State cars

at

New York Show—Jan. 11th-13th, 1913
Space 29 Grand Central Palace

Chicago Show—Feb. 1st-8th, 1913
Space Q3 Coliseum Annex

Boston Show—Mar. 8th-15th, 1913
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INTER-STATE AUTOMOBILE CO.
2712 First Street
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We have had to double our gigantic output—and the demand is more than doubling. Nearly 180,000 have been sold and delivered. New prices \$525 to \$800. Dealers everywhere. Ford Motor Company, Detroit, Michigan.

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Save Tires—Save Fuel—Save Car. Make cars easier riding and easier driving. Stronger than any other practical wheel.

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Every Car Owner Needs Champion Priming Plugs
They Start Any Motor on First Quarter Turn

Mr. Dealer, you know that there are thousands of cars which cannot be started in cold weather without priming.

CHAMPION PRIMING PLUGS

are absolute winter necessities on cars without priming cocks, and they are often wanted badly on cars that have such devices.

FOR SALE EVERYWHERE AT \$1.25 PER PLUG



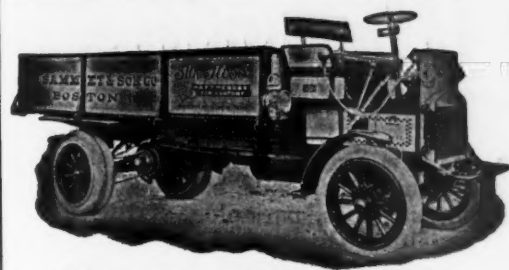
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Trial set of four Champion Priming Plugs, fully guaranteed, prepaid to any car owner for \$5. Give name of car and year of make—also name of your dealer.

All jobbers and most dealers are already supplied. Write today. Liberal trade discount to dealers. Be ready to supply your trade in advance of our big advertising campaign in the great national weeklies.

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Write for catalog and complete specifications telling why DECATUR TRUCKS are best

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GRAND RAPIDS, MICHIGAN

The Truck with a reputation for Economy Efficiency Durability and Low Operating Cost. Our Trucks are used in sixty-one different lines of business.

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Made by the pioneers and masters of the craft. Mechanically perfect and built of the finest material procurable, they give the utmost in service and efficiency.

A type and size for every car and any tire

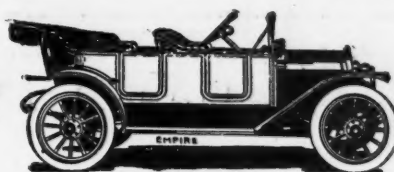
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CLEVELAND, OHIO

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"The Little Aristocrat"

The Completely Equipped Empire five-passenger touring car for \$950—Equipment includes Mohair Top and envelope, Windshield, Prest-O-Lite tank and Speedometer.

THE EMPIRE AUTOMOBILE CO., Indianapolis, U.S.A.

KISSELKAR

"Thirty"
"Forty"
"Fifty"

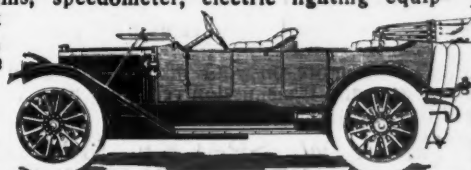
Extra liberal wheelbase

—roomy tonneaus

—flexible motor—big 60 H. P. "Six"

wheels and tires—strikingly attractive and a car of unusual comfort. KisselKar prices include full equipment—self-starter, top, windshield, demountable rims, speedometer, electric lighting equipment, shock absorbers, etc. Write for catalog.

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CAR CO.
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Rushmore Electric Car Lighting

Ballast
Coil
Full Size

TEN INCHES of iron wire (the ballast coil) performs all the functions of the usual slipping clutch, moving field regulators, and other regulating mechanism.

Weight of No. 1 dynamo, 28½ lbs. Output 16 amperes. Headlights of 30 candle power supplied without daylight charging.

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KNOCKS THE HIGH COST OF GASOLINE

Buy gasoline and oil by the gallon—get the *inside* price. Then store it in an airtight, evaporation-proof, fireproof AMERICAN STORAGE SYSTEM. The system will pay for itself. Send for literature.

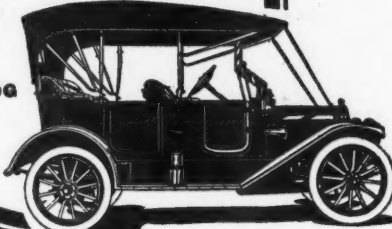
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DAYTON, OHIO

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GET OUR 1913 AGENCY PROPOSITION
WRITE US THIS MINUTE
IT'S ALL VELVET FOR YOU
W. H. McINTYRE CO.
Auburn
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ZENITH

gives

Standard Carburetion

ZENITH CARBURETOR CO.
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WE have published a very interesting book on the advantages of Underslung construction. It is of value to dealer or individual. It tells of our full line which ranges in price from \$1475 to \$4500. Write for a copy today.

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FINISHED DIE CAST BEARING BUSHINGS



Made to Specifications
From any of the High Grade Motor
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WE GIVE YOU WHAT YOU WANT
Let us have your blue prints

Let us also quote on your piston, piston ring, piston pin, motor gear and transmission requirements. We have special facilities for producing this work.

THE F. W. SPACKE MACHINE CO.
INDIANAPOLIS, IND.



**DON'T
THROW AWAY YOUR
OLD TIRES**
COVER THEM WITH
STEEL
AND
USE THEM
FOREVER

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**SKID
BLOWOUTS
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WEARING OFF
OF RUBBER
NIT**

Each section 2 in. wide. They hook to rims. Try two or three sections over any old blowout. Special prices to the first in new territory

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ROYALTY PROPOSITION TO AUTO-
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Kingsdon IGNITION DEVICES

High and low tension magnetos, make-and-break coils, dash coils, box coils, motorcycle coils, switches, spark plugs and other ignition specialties. Guaranteed satisfaction.

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AKRON, OHIO

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(673)

THE GOODYEAR TIRE & RUBBER CO.
AKRON, OHIO

Imperial



Three Astonishing Prices— SIX BIG FEATURES

Model 44.....\$1750
Model 34.....\$1400
Model 32.....\$1250

Four real doors,
center control, sil-
ent enclosed mo-
tor, long stroke,
demountable
rims, big tires,
long wheelbase.

IMPERIAL AUTO CO., JACKSON, MICH.

Hook up with **COLE**

COLE

Series Eight comes in Three Chassis:

Cole Sixty six cylinder Touring Car, five passenger convertible to seven passenger, 132-inch wheel base, Delco electric lighting, starting and ignition. \$2485

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Cole Forty four cylinder Touring Car, five passenger, 116-inch wheel base, Delco system. \$1685

WRITE TODAY for Cole Blue Book and dealer's proposition.

COLE MOTOR CAR CO., Indianapolis, Ind.

Hook up with **COLE**

MARMON
"The Easiest Riding Car In The World"

THE MARMON "32"

32-40 h. p., 120-inch wheelbase, dependable electric starting and lighting system, left-hand drive, center control, nickel trimmings, with newest body types to meet every requirement and corresponding equipment—

\$2,850 to \$4,100

THE MARMON "SIX"

48-60 h. p., 145-inch wheelbase, dependable electric starting and lighting system, left-hand drive, center control, nickel trimmings, with body types to meet every requirement and corresponding equipment—

\$5,000 to \$6,350

Detailed Information on Request

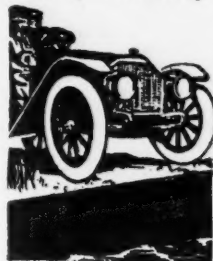
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Indianapolis (Established 1851) Indiana

Sixty Years of Successful Manufacturing

J-M NON-BURN BRAKE LINING

Gives Sure Control of Car

It will lock wheels almost instantly in emergencies. Repeated impartial tests prove this. Or, with a light pressure on brakes, it will stop car as slowly as desired.



And J-M Lining retains its exceptional gripping power as long as there is a thread of it left, because it is made of pure Asbestos, and nothing affects this mineral. Frictional heat cannot char or burn it; oil, gasoline or water cannot injure it.

Write nearest Branch for sample and booklet.

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You have seen it—and admired it. Probably you did not know that it was a Robbins body. Probably you have wondered whose design and construction produced that handsome Sedan.

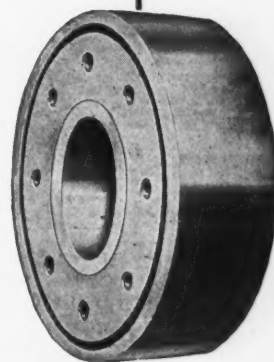
For your own comfort, you will need a Sedan body this winter.

LET US DESIGN IT

IRVIN ROBBINS & COMPANY

Address Sedan Dept. 10th and Canal, Indianapolis, Ind.

"Hyatt
Quiet
Bearings"



Hyatt Roller Bearing Co.
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Mighty Michigan "40"

40-Horsepower Touring Car or Roadster, absolutely silent in operation. Oversize tires 35x4 1/2—cylinders 4 1/4 x 5 1/4 in.—118-in. wheel base—four-forward-speed transmission—demountable rims—nickel mountings—massive, straight-line body—big, roomy seats—electric lighting by generator—everything. Price \$1585, includes full equipment. Two smaller models. Catalog on request.



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Stand
No. 539
Basement
Jan. 11th to 18th

CAN BE HANDLED BY ONE PERSON AS EASILY & QUICKLY AS AN UMBRELLA
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GOLDE-PATENT MANUFACTURING CO. 531 W. 56th ST. NEW YORK.

FINISHED CRANK SHAFTS COMPLETE CONNECTING RODS COLD DRAWN STEEL SHAFTING

Screw Stock, Flats, Squares,
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FINISHED MACHINE KEYS - MACHINE RACK

All material finished to a
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STANDARD GAUGE STEEL CO.
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Cut Gears of Quality Complete Differentials

The
NEW PROCESS
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EISEMANN

Has Always Led

Ask us to tell you about the wonderful new pole pieces and the Automatic Control Magneto.

THE EISEMANN MAGNETO COMPANY

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Dorris
Built to Last

We are now arranging
agencies for 1913

WRITE FOR FULL PARTICULARS

DORRIS MOTOR CAR COMPANY, St. Louis, Mo.

GO TO BLAZES



with one of our effective Fire Extinguishers and observe the Opposition it Raises against further fire destruction. Invaluable for every car, garage or factory. Chemicals used act instantly and will not injure self or car.

List \$1.00 Each Dealers Write for SPECIAL PRICES

THE MOTOR CAR EQUIPMENT CO.
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Schacht

THE CAR
THAT CAPTURED FIFTH
PLACE AT INDIANAPOLIS, MAY 30TH

Here is Model "NS"—Electric Starter, Electric head lights, side lights and tail lamp operated with generator and storage battery, 36 x 4 demountable rims with one extra rim, folding zig-zag wind shield, trip speedometer, aluminum adjustable ventilator in windshield base, robe rail, foot rail, tire irons, horn, pump, all tools, jack and tire repair outfit. Price \$1850. Send for dealers' proposition.

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2921 Spring Grove
Avenue
CINCINNATI, OHIO

\$1850

The New
Swinehart

KEATON NON-SKID TREAD TIRE
has four times the wearing service of the ordinary non-skid. Users will tell you that they have run Swinehart Keaton Non-Skid Tread Tires a whole season without having them lose their anti-skid effectiveness. Call at any one of our stores and investigate them. We also make a complete line of Smooth Pneumatic Tires of best quality. Branches and distributing agencies in all leading cities.

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GASOLINE TURBINES

Half the size Half the weight,
Half the fuel Half the friction

No Valves
No Springs

No Adjustment
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No Back Pressure

No Muffler
No Noise

There isn't much left

SMOOTH AS ELECTRIC

WILL REPLACE ANY ENGINE IN ANY CAR
BOOKLET UPON REQUEST

(Exclusive territory open for live agencies)

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"Firestone" Tires and Rims

are the least likely to require changing, and afford the best means of tire changing when required.



The Firestone Tire & Rubber Co., Akron, Ohio
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WINTON SIX

In the Survival of the Fittest

John C. Wetmore, in the New York Evening Mail, says: "When one comes to figure out who will make up the surviving squadron, should the industry come to a 'survival of the fittest' stage, it is the one best bet that the house of Winton will be found standing on Uncle Sam's automobile road."

Shall we send our latest catalog?

THE WINTON MOTOR CAR CO.
424 Berea Road, Cleveland, O.

World's First Maker of Sixes Exclusively

"Pass Them All"



Motor Cars

Send for Pleasure or Commercial Catalogue.

KNOX AUTO CO., SPRINGFIELD, MASS.



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Oldest and Leading European

Ball Bearing

Mea Magneto

Write for Particulars
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Sole Importers

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Hupmobile

Hupmobile "32" Touring Car, Fully Equipped, \$975, F. O. B. Detroit
Long stroke motor, 8 1/2 x 5 1/4". Center control.
Enclosed valves. Zenith carburetor.
8 bearing crank shaft. Bosch Magneto.
Unit power plant. 106-inch wheelbase.
Multiple disc clutch. 32 x 3 1/2" tires.
Three speeds forward. Quick detachable rims.
Sliding gears. Mohair top with envelope.
Full floating axle. Jiffy curtains.

Magneto and camshaft driven by silent Coventry chain.
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Chassis and specifications same as Touring Car. Large turtle back dust-proof compartment for extra accessories, tires and baggage.

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Chassis same as Touring Car. Carrying capacity, 800 lb.
Enclosed panel body. Chassis & body painted black, high-class finish.
2 cushioned Lacy-back seats. Two-piece windshield.
Prest-O-Lite Tank. Gas headlights.
Oil side and tail lamps.
Quick detachable rims.
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the 1913 book of information
about Automobile Electric Light-
ing and the up-to-the-minute line of

Guide

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"Always There"

The new non-vibrating "TS" SPLITDORF COIL is equally effective with all the newer as well as older models of the famous SPLITDORF low-tension system.

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SPLITDORF ELECTRICAL CO.

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Lippard-Stewart

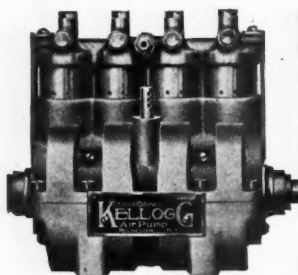
Delivery Cars

Good Business
For Dealers

LIPPARD-STEWART CARS have more strong selling points than any other light delivery car on the market. They have all that make them valuable to discriminating users—the minimizing of up-keep expense, left-hand drive, improved spring suspension, every possible mechanical excellence, and the elimination of unnecessary parts. These are but a few of the LIPPARD-STEWART points that will be of value to dealers. Capacity 1500 lbs. Price \$1,800.

Write for our dealers' proposition.

Lippard-Stewart Motor Car Co.
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Four Cylinder KELLOGG Air Pump

Has been adopted as part of the regular equipment by leading manufacturers for their 1913 cars, because they realize that good accessories help the sale of their cars.

The Kellogg Tire Pump inflates the largest tires to any desired pressure in the shortest space of time, and relieves you of all unnecessary labor.

Your dealer knows the merits of the Kellogg and will be glad to put one on your car.

For more complete information, send name of car and address.

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We Ship On Approval

PREPAY FREIGHT AND ALLOW

30 Days Free Trial

The best "Nonskid" puncture-proof device on earth for automobiles and motorcycles.

Try Them At Our Expense

Be your own judge—don't take anyone's word for it. "The proof of the pudding is in the eating."

IT ONLY COSTS ONE CENT to learn our unheard of prices and marvelous guarantee on Britson Detachable Treads.

Write Today for Full Particulars

The Britson Mfg. Co.
1213 Britson Building
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ZERO-40

**THE IDEAL RADIATOR FLUID.
A Natural Mineral Water. Guaranteed
Not to Freeze at 40 Below Zero**

As harmless to metals and rubber as ordinary water. Evaporation is replaced with ordinary water, but leakage must be replaced with Zero-40.

ZERO-40 in your car removes the possibility of damage either by frost or corrosion.

We will send under the above guarantee a five-gallon can of Zero-40 to any address in the United States, charges prepaid, on receipt of five dollars.

DEALERS—Write to us for the address of our nearest distributor who is under contract to supply you in any quantity.

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Croton cars incorporate all of the features for which the buyer looks in the new models.

Write for catalog and agency details.

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FOR PROPER AUTOMOBILE LUBRICATION

"It Makes a Difference"

**PERFECTLY FILTERED ALWAYS BURNS CLEAN
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SOLD BY
All Garages
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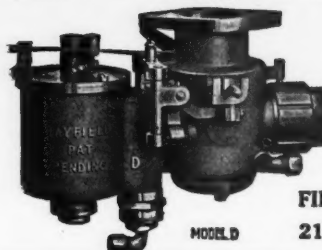
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All Makes of Cars
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Four and Six Cylinder Models
\$1000 to \$3000

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"OLYMPIC"
\$1500
4 cylinders

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6 cylinders

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AUTOMOBILE CO.
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Standard Universal Rims



fit any style or make of tires. The side rings are reversible, they curve outward on one side to fit a straight side tire, inward on the other to accommodate a clincher. Two turns of a nut unlocks the rim for demounting, two more turns locks the rim in place.



Write for catalogue 606,
which explains fully.

THE UNITED RIM CO., AKRON, OHIO

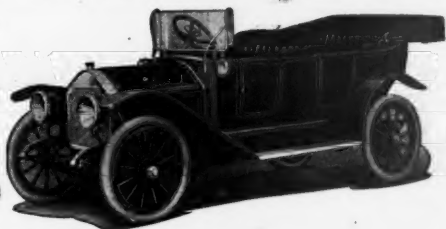


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Outfit Will Save 9/10
of Your Tire Repair
Expense. \$2.00.

Sent anywhere express prepaid upon receipt of \$2. Money back if you ask it. We guarantee that with a Tire-Doh Outfit you can permanently repair every injury that can happen to a tube or casing absolutely without vulcanizing and at one-tenth its cost. You can repair punctures, blow-outs, cuts—in both tube and casing—15 minutes for a puncture, an hour for a blowout. Don't confuse this genuine Tire-Doh Outfit with the many worthless imitations, packed like our outfit and offered by unscrupulous dealers trading on our reputation. There is only one Tire-Doh Outfit. It comes in a white enameled can (like cut). The name is our registered trademark. Get the genuine guaranteed article direct from us, if your dealer won't supply you. Sent anywhere express prepaid upon receipt of \$2.

ATLAS AUTO SUPPLY CO., 73 E. ADAMS ST., CHICAGO, ILL.

Model "P"
Five
Passenger
Touring
Car
Four-Cycle
Four
Cylinders
4½ x 5¼
inches



40 H. P.
Long
Stroke
Motor
Price
\$1750.00
Cylinders
Cast in
pairs ½
inch offset

ENGER
"THE CAR OF VALUE"

Positive electric starter, electric lights all around and electric horn. Unit power plant, enclosed valves, three point suspension. Wheel base 120 inches, full floating rear axle, ¾ elliptic rear springs, demountable rims with 38x4 tires, straight line bodies. Made in three models. Speedometer with grade indicator and eight-day clock with electric light—"Everything you need in a car."

New Catalog tells all about the Enger—"The Car of Value." It's of interest to both Dealers and Individuals. Write for it today.

THE ENGER MOTOR CAR CO., 2101 Gest Street, Cincinnati, O.

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AXLES WHEELS
TRANSMISSIONS

W & S Salisbury Wheel & Mfg. Co. W & S
JAMESTOWN, N.Y.

McFARLAN

Electric
Lighted

SIX

Self
Starting

SERIES "S"—45 H. P., 2, 4 and 5 Pass.—\$2,300
SERIES "T"—50 H. P., 2, 4 and 5 Pass.—\$2,500
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New Six Passenger, Coupe and Limousine
Bodies slightly higher

TERRITORY OPEN FOR PROGRESSIVE DEALERS

Pioneer Six-Cylinder Car Builders of America

McFARLAN MOTOR CAR CO., Connorsville, Ind.



Great Western
FORTY
1913 FULLY \$1585
EQUIPPED
LUXURY — POWER
ABSOLUTE SILENCE
WRITE FOR OUR NEW CATALOGUE
GREAT WESTERN AUTOMOBILE CO.
DEPT. 20 PERU, IND.



Diamond
SAFETY TREAD
(Squegee) **TIRES**
Won't Slip - Won't Slide
Won't Skid - They Grip!

THE DIAMOND RUBBER CO. OF N. Y.
Subsidiary of The B. F. Goodrich Co.
Akron, Ohio

**The Kinsey Manufacturing
Company, Toledo, Ohio**

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KINWOOD RADIATORS, FENDERS,
KINWOOD OILERS, GASKETS,
KINWOOD STEEL FRAMES,
ETC., ETC.

SPECIAL METAL STAMPINGS

The Inner Tube Repaired in 15 Minutes
on the road or at home—do it yourself. It is easily done, if
you have the

Imperial Vulcanizer Repair Kit
(Pays for itself in a short time)

No electricity. No steam.
A little rubber and a little
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Price \$3.50

Complete with enough
rubber for 40 punctures.



Nickel Plated Patent Pending

AT YOUR DEALER'S OR SENT BY EXPRESS
Guaranteed to Satisfy or Money Refunded

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LOZIER

A LOZIER FOR \$3,250!
(A Self-Seller)

A completely equipped Light Six which will meet the big
demand for a really high-class car of this type.
Dealers from coast to coast who have investigated the
LOZIER "Self-Seller" say it is the greatest motor car value
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AUTO METER

For 1913 the
Warner Auto-
Meter is the choice
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This coming season
it will be found on
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THE PROFIT MAKING PLANTS



The vulcanizing
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SOLID PADS and
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Plants from
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**REPUBLIC STAGGARD
TREAD TIRES**

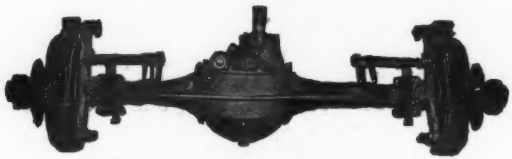
Republic Staggard Tread Pat. Sept. 15-22, 1908

The tires you will find on the cars of experi-
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We also make a complete line of Motor Truck
tires, designed to
give unexcelled
service under the
most trying con-
ditions.



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Youngstown, O.
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**American
AXLES**



Write today for our booklet

THE AMERICAN BALL BEARING COMPANY
Cleveland, Ohio

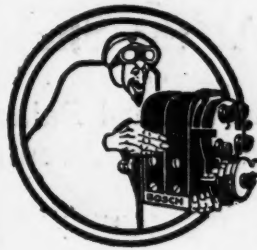
Our Engineers

Are ready and anxious to consult with you at any time on any plan or print.

WESTON MOTT & CO.

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Oldest and Largest Manufacturers of Automobile Axles, Hubs and Rims in the World



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Of Course

No matter what car you own or buy it needs a Bosch Magneto with Bosch Plugs.

Be Satisfied

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Bosch Magneto Company, New York

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If not, write or wire us today. The Paige "36" at \$1275 and the Paige "25" at \$950 are the leaders in the popular price field. You want them, if you can get them.

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SPARK PLUG PUMP

Lets the Motor
fill the
Tires



Adaptable to
All Makes
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Simply substitute the pump for any spark plug, let your motor run, and without a bit of exertion on your part it will fill your tires with cool, pure air. It weighs but 2½ pounds and can be conveniently carried

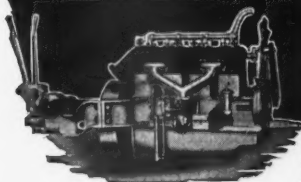
under the seat. So simply constructed it cannot get out of order. It will last as long as your motor. Adapted to any car. To be had at one-half the cost of high-priced complicated pumps.

Price, Complete, \$10.00

Take advantage of our trial offer and give it a chance to make good on your car.

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Afford the utmost in reliability and power—with the least weight and fuel consumption. You can add much value to your car by using the Model Motor. We make them better and at less cost than you can, because we specialize in motors and power units. Write us for facts.

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2 Passenger Roadster.....\$2,900.00
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COMPLETE EQUIPMENT, INCLUDING
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A GRADE FOR EACH TYPE OF MOTOR

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37-A, 30-40 h.p.....	\$1475	36-A, 30-40 h.p.....	\$1425
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All cars fully equipped

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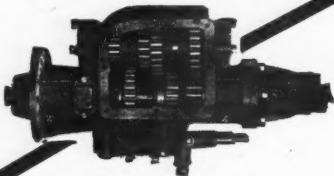
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COVERT TRANSMISSIONS GIVE perfect service, because they are designed and built by men thoroughly acquainted with every requirement that is made by a motor car transmission.

For Commercial Vehicles of from 500 to 10,000 lbs. capacity.

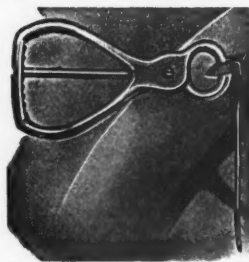
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Shock Absorbers



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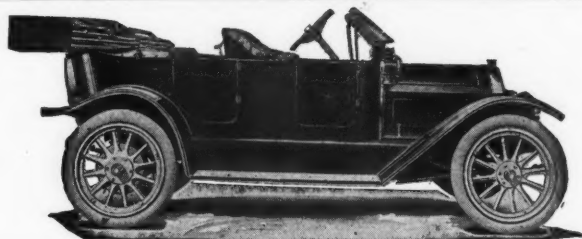
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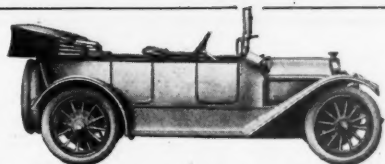
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Safest—Surest—Best
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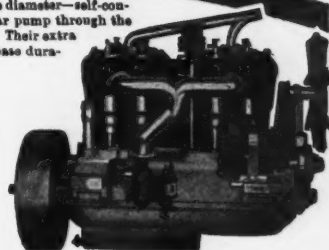
Wisconsin

Motors

ALL 4 CYCLE—5 TYPES

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4 1/2-inch bore.....	5-inch stroke.....	4-cylinder
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4 1/2-inch bore.....	5 1/2-inch stroke.....	4-cylinder
5-inch bore.....	7-inch stroke.....	4-cylinder

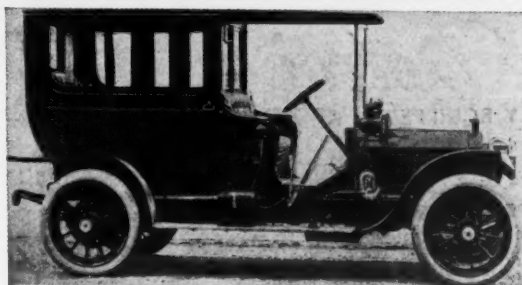
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Writes: "Dixon's Automobile Lubricants are the best ever and I would not be without them under any circumstances."

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The ONLY gas tank that, when empty, can be immediately exchanged for a full one, ANYWHERE and ALWAYS.

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The ONLY gas tank that dealers can profitably and safely handle.

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Three Great Models: Pilot 40—Four cylinders, 4½x5; brake test, 55 horse-power; 120" wheel base; price, \$2000. Pilot 50—Four cylinders, 4½x6; brake test, 59 horse-power; 126" wheel base; price, \$2250. Pilot 60—Six cylinders, 4x6; brake test, 67 horse-power; 132" wheel base; price, \$2500.

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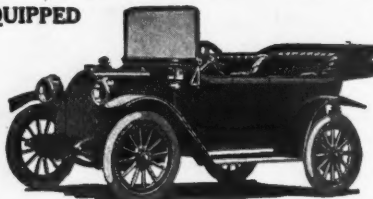
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Five
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Touring
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25 H. P.
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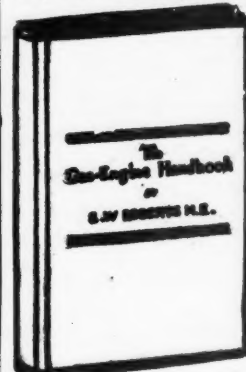
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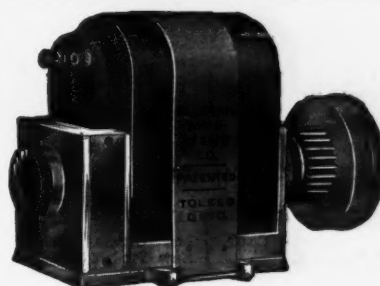
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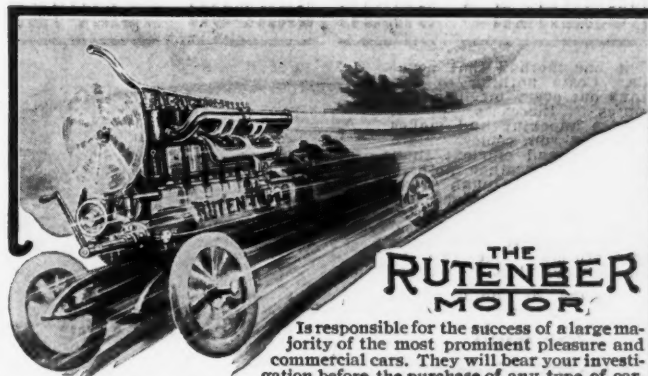
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YOU CAN STOP
YOUR CAR IF
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EXTERNAL
BRAKES
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Absolutely Prevent Skidding

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For your own safety—for the safety of the public, fully equip your car with Weed Chains

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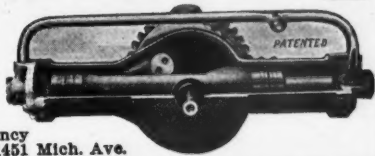
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We Specialize in High-grade Automobile Parts

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Great America's
Greatest Touring Car

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Dec. 19th and Jan. 16th

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I know there isn't anybody who can describe the chime-like signal of the Aermore Horn to you. So I want you to hear it—

The **AERMORE**
Exhaust Horn
—the horn harmonious

I want you to write me and I'll tell you where and how you can hear the singing, organ-like tones of the Aermore. Just drop me a postal.

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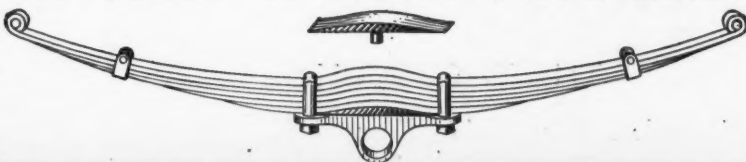
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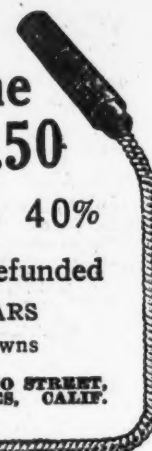
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Why not please and also protect your trade?
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Long stroke, powerful Continental Motor—
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Bodies and Tops. A combination of power,
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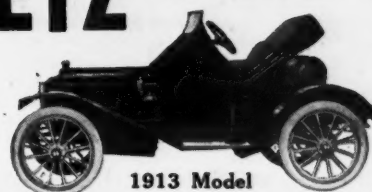
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Four Sparking Points
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\$1.50 Least expensive because it stands up best.

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From any dealer, or **HERZ & CO.** 285 Lafayette St., New York
Ask for Blue Enamelled Stone.

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COMPLETELY
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LEFT-HAND DRIVE
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22½ H. P., 4-cylinder water-cooled motor, Bosch magneto, standard
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Guaranteed 5,000 Miles
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NO MORE PUNCTURES
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We urge you to see this Protector,
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Write at once for full particulars of my
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(103)

The 1913 Staver is a genuine reve-
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GALLAGHER-TOMPKINS CO.
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We supply you with the one and save you the other. Ham's Truck and Pleasure Car Lamps are America's very best.



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Spark Coils Are Dependable

They are long lived, water-proof, heat resisting, simple in construction and of low battery consumption. They give a spark that's a flame. Magnets, Coils, Plugs, Timers, Switches and other Ignition Goods.

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TWO MODELS ONLY

Five-passenger Touring Car..\$1475

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The same chassis is used for both models

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It is known as Oildag. As an automobile lubricant it increases power, reduces the oil consumption and prevents carbon, spark plug and valve troubles.

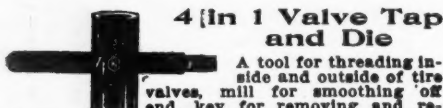


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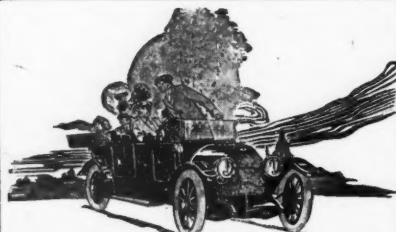
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4 in 1 Valve Tap and Die

A tool for threading inside and outside of tire valves, mill for smoothing off end, key for removing and replacing insides. Sent to any part of U. S. upon receipt of 25c.

Special price to dealers and jobbers in quantities
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30-40	Fore-door Roadster, 116-inch wheel base	\$1700
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AUTOMOBILE TOPS Write for catalogue and prices. We can save you money.

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THE STANDARD OIL FOR MOTORS

We begin to perfect Polarine Motor oil at the point where other oils are deemed finished. We have spent hundreds of thousands of dollars for the machinery required by these extra processes alone. It is the "cream" of motor oils. You ought to try it.

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That's the verdict of the makers of 80 per cent of the high-grade American cars. The test of experience has proved them to be the quality lamps for the quality car—the only lamps absolutely reliable and dependable at all times.


You can have Solars on your car, if you insist.
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Combination
Electric Starting
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The Official Car
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**Three Transcontinental
Routes**
in one season in one car

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MADE IN INDIANAPOLIS

Write today for 100 & 1 Reasons why
the Pathfinder is the car
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**The "All-in-One"
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All that the name implies
Prime your engine and
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**Powerful
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Made to fit
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We shall prosecute
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The
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A Tire Reinforcement
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GUARANTEED

Ask Any User

Made of the best, is the best, and
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**C.O.T.
TIRE SOLDER
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Guaranteed to repair cuts in
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without heat or vulcanizing. Ask
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Every Goodrich Tire should bear a
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SIX CYLINDER—UNIT POWER PLANT
THREE POINT SUSPENSION**

The Continental "Six"
is maintaining, on the
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Four Cylinder types.

Built to accommodate
any type of self-starter
now made. Suitable for
right or left hand drive.

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Showing simple and eff-
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4 and 6 cylinders,
20 to 70 H. P.

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SPARK PLUGS**


Ignition Absolutely Sure

RAJAH AUTO SUPPLY CO. Bloomfield, N. J.

JOHN MILLEN & SON, Ltd.—Montreal, Toronto, Vancouver, Winnipeg.

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**Auto Top and Slip
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Two Tones from one
push button

The TUTO Horn never fails to respond
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because there is no complicated mechanism to get out of order.
The TUTO gives either a low note for service purposes or a loud
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Exclusive selling rights in a few states left

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**SCHRADER
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The Standard American
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A 7 PASSENGER, 40 HORSE POWER White Steamer and one 20 h. p. 4 pass. Both machines like new. Joy valve engines, kerosene burners, operating for one-half cent per mile. Address Box D 151, c/o Motor Age.

CADILLAC LIMOUSINE, WITH EXTRA touring body, top, glass front and fenders, overhauled, guaranteed like new, 1911 model. Iowa Auto & Tire Co. (Cadillac Agents), Davenport, Iowa.

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FOR SALE—1911 HUDSON AND CHAL- mers touring cars, with two taxi bodies. Full particulars. Address J. McDonnell, Aetna Hotel, Danville, Ill.

FOR SALE—1911 MODEL STODDARD- Dayton automobile, 7-passenger, 50 h. p., equipped with all auxiliaries. In perfect condition. Address Box D 220, c/o Motor age.

GOING TO BUY A USED CAR?

Let us send you the names of individual owners. Free weekly report gives complete descriptions, prices, etc. Save money by dealing direct. Write now.

Auto Reports Bureau
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LATE MODEL PAIGE-DETROIT ROAD- ster fully equipped in good mechanical condition. Will sell at a very low price. The White Co., 2635 Wabash Ave., Calumet 5311, Chicago.

LATE MODEL WHITE STEAMER, 5- passenger; fully equipped; top curtains, new shield, horn, speedometer, Presto tank and lights, power pump. Cash, \$550. W. F. Schwieterman, Osgood, O.

MITCHELLS REBUILT, GUARANTEED.

These cars are fully equipped. Call or write for further particulars.

Mitchell Automobile Co.
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MOST SENSATIONAL AUTOMOBILE

Bargain Ever Offered.

1912—New—1912
Regular Price, \$1,950
Our Price \$1,085

These cars were ordered by a large export house, but owing to the Balkan-Turkish war they have preferred to forfeit a substantial deposit rather than ship automobiles to the continent in the present unsettled condition of affairs.

We have taken this contract off their hands and are offering these new high grade cars at practically

One-Half the Price.

The manufacturer having agreed with us that if we did not use his name in our advertising, he would continue the regular guarantee on these cars, which is

Guaranteed for Life.

So, therefore, we are not mentioning the name of the car, but the name will be sent you on request. Upon receipt of this information, ask anyone who ever owned one of these cars, and they will tell you there is

No Better Car Made.

And they will never give you a minute's trouble. We have them on exhibition in our showroom, 1210-1212 Michigan Ave. If you have failed in the past to avail yourself of one of the many bargains we have offered the trade and public from time to time on new cars, DO NOT LOSE THIS, as it is the GREATEST BARGAIN EVER OFFERED. ACT QUICKLY. At the low price we sell our merchandise, we must move them quickly—and we do. They are one of the most beautifully designed and easy riding cars built, being light in weight and extremely attractive.

Here are a few of the interesting features. For instance:

A 4½x5½ four-cylinder, long stroke Continental motor, equipped with magneto and battery system. A chassis, with oil-tempered springs, chrome nickel steel shafts, Timken roller and Schaefer annular ball bearings throughout; full floating type rear axle, a multiple disc clutch; extra large, strong artillery wheels; oversize tires, 36x4, equipped with Universal demountable rims. Wheel base 120". Also a big, roomy, ventilated fore-door body, flush side, painted, trimmed and upholstered with the greatest care. The latest electric light system.

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Largest Automobile Dealers in the World
1210-1212 Michigan Ave., Chicago, Ill.
Open Sunday till 4 P. M.
Open Evenings till 9 P. M.

PACKARD DEMI-LIMOUSINE; BEST OF condition. Krit coupe, just overhauled and painted, for sale cheap. Ajax Auto Co., 834 E. 43d St., Chicago.

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Rebuilt cars like new.
Must sell quickly to make room for new Models.

1911 Stearns. 1910 Winton.
1911 Chalmers. 1909 Peerless.
Will make special price to move these cars.
The Quality Car Co.,
2329 Michigan Ave., Chicago.
Cal. 4501.

STEARNS-KNIGHT TOURING CAR

Condition like new; driven but 3,000 miles. Has complete equipment, including seat covers. This car is like new. Have sold original owner 7-passenger Stearns. Price, \$2,250. Manchester Auto Garage, 75 Granite St., Manchester, N. H.

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We offer the greatest
AUTOMOBILE BARGAIN
That has ever reached Chicago.

A New \$1,500 Roadster,
Our Price, \$875.

Again it is one of the best known cars on Michigan Ave. It is strictly up-to-date, comes fully equipped and is generally admitted to be one of the classiest roadsters on the street.

There are only a very limited number and we regret to say that many of our friends and customers are going to be disappointed in not being able to get one.

We take this occasion to impress upon you the necessity of buying at once if you have any intention of getting in on our latest and what we consider the best bargain ever offered.

Look over these specifications. Motor, 4 cylinder, 30 H. P., bore 4½, stroke 4½, valves 2½ in., connecting rod bearings, 1½ in., constant level oiler with sight feed on the dash, operated by plunger pump.

Transmission—Three speeds forward and one reverse, with Schefer annular ball bearings.

Clutch—Multiple disc, running in oil.

Rear Axle—Full floating, with nickel steel gears and shafts. Timken roller bearings throughout. 12-in. internal expanding brakes. Pressed steel brake drums and hubs. Drop forge driving flanges.

Front axle—Drop forge I-beam, Timken bearings.

Springs—Front, 38 in.; rear, 44 in.

Wheels—34-in., with demountable rims.

Wheel Base—110 in.

Ignition—Splitdorf dual system.

Equipment—Electric lights, 100 ampere battery, mohair top with side curtains and boot, zig-zag shield, speedometer, horn, complete tool kit, and nickel finished throughout.

There are many other features that we would like to specify, but space does not permit. Come and see these cars at once. By getting your order in now you will secure one. A day or two late may deprive you of the greatest roadster bargain that we have ever offered.

REMEMBER THIS IS

A \$1,500 new roadster, guaranteed for life, that we are offering for \$875.

TIMES SQUARE AUTOMOBILE COMPANY
1210-1212 Michigan Ave.
Chicago, Ill.

THREE-TON GRAMM AND FOUR-TON Knox Trucks, \$2,250 and \$2,750; will trade for Coast real estate. Clarke, 529 Hamilton Bldg., Portland, Oregon.

WE HAVE REAL BARGAINS IN USED cars: One E. M. F. run less than 7,000 miles; all new tires and complete in every way, \$600; 1 Buick roadster, complete, \$375; 3 1911 Fords, complete, \$375; 1 5-passenger Reo, \$250; 1 Westcott, \$100; 1 McIntyre, \$100. The above cars have recently been overhauled and are in good shape. Mankato Automobile Co., Mankato, Minn.

1905 PACKARD 4-PASSENGER, GOOD shape, \$300; 1907 Thomas 7-passenger, double chain, \$200; 1-cylinder Cadillac or Olds, each, \$50; 1907 Thomas and model R Stevens, parts cheap, front and rear axles with wheels, \$10. Fred Peulecke, 9237 Houston Ave., South Chicago, Ill.

1909 FOUR-CYL., 40 H. P. WINTON; NEW tires; completely equipped; \$400. Address Box D 224, c/o Motor Age.

1910 AMERICAN—SEVEN PASSENGER, 50 h. p.; overhauled; new top; \$800. Address Box D 227, c/o Motor Age.

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1911 CHALMERS 30—4-PASSENGER; NEW tires; complete equipment; \$700. Address Box D 228, c/o Motor Age.

When Writing to Advertisers, Please Mention Motor Age.

1912 CHALMERS 30—RUN ONLY 4,500 miles; fine shape; \$1,000. Address Box D 228, c/o Motor Age. mc

1912 COLE 40—5-7 PASSENGER, COMPLETELY EQUIPPED, INCLUDING ELECTRIC LIGHTS AND EXTRA SEATS. Repainted. Tires nearly new. \$1,140.00. O. C. Peterman, Jamestown, N. Y.

1913 PACKARD—WILL DISPOSE OF MY new 1913 6-cylinder, 7-passenger touring car at a bargain, if taken immediately. Address H. M. Wallis, Jr., Racine, Wis.

4-20-PASSENGER AUTOMOBILES IN A-1 condition, have been operated between city and summer resort, conditions have changed is reason for selling them. Address 47 Highland Terrace, Brockton, Mass. m

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AUTOMOBILE WANTED—WILL TRADE A tract of A1, well located, high, pine citrus fruit land for 5-passenger car in good condition. Address J. Walker Pope, Winter Haven, Fla.

TO EXCHANGE—MOTORCYCLES FOR runabout. Wolke Cycle Co., Louisville, Ky.

WANTED—FOUR-CYLINDER RUNABOUT. Wolke Cycle Co., Louisville, Ky.

WANTED—1912 AUTO IN EXCHANGE for 160 acres good Minnesota land. Address Box 414, Marshalltown, Ia. k

WE BUY AND SELL YOUR AUTOS FOR cash. If you have a Touring Roadster, Limousine, Taxicab, Commercial Car, Truck or Sightseeing Car and desire to dispose of it quickly, communicate with us. Give us full description. Late models and in good condition. Strictly business. Enclose stamp for reply. Universal Auto Sales Co., 1826 Wood Ave., Harrisburg, Pa.

Parts and Accessories FOR SALE

A BARGAIN—TWENTY SETS OF MARSH Rims, Q. D., size 36x4. Twelve Bodies—four and five passenger—high grade. The Sebring Motor Car Co., Sebring, Ohio.

A BATTERY BARGAIN—6-80 STORAGE batteries, Exide, Vesta, National, Universal, for auto igniting and lighting, \$1.50 to \$7.50. 4105 Cottage Grove Ave., Chicago. a

A LIMITED NUMBER OF NEW HIGH grade 25-30 and 30-35 h. p., four-cyl. motors with Remy magneto and coil. Only a few left. Prices very low. F. E. Alford, Goshen, Ind.

ALL NIGHT MACHINE AND GARAGE CO. Shop operated every hour of every day. No extra charge for night work. Make any part for any car. We hurry you. 7031 So. Chicago Ave., near Cottage Grove Ave., Chicago. Dan Morgan Smith (owner); Ph. Normal 3266.

ALUMINUM VULCANIZERS FOR BOTH casings and tubes. \$2.00 prepaid to any address. Money back if not satisfactory. Truscott Supply Co., St. Joseph, Mich.

ATTENTION—HENRY OWNERS

Having purchased the repair business of the Henry Motor Co., we are prepared to fill orders promptly for repairs for Henry cars. Muskegon Automobile Co. Muskegon, Mich.

AUTOMATIC ENGINE STARTERS (Spring), guaranteed; \$100 to \$125. J. W. Tudor, 35 Congress St., Boston, Mass.

AUTOMOBILE BODIES, PLEASURE AND commercial.

Foredoors for open-front cars. Write for prices. Auto Specialty Mfg. Co., 326 E. Market St., Indianapolis, Ind.

PEERLESS AUTO TOP DRESSING.

A waterproof dressing for leaking mohair and duck tops and curtains. Makes old and faded tops look like new. Ask your garage and supply dealer for it.

The Columbus Varnish Co., Columbus, O.

A WET CLOTH AND A PACKAGE OF Ar-Gen-Tor is all that you need to plate all the brass trimmings on your car with a heavy, permanent plate of pure silver. Your car will always look new, and you will not have to polish brass any more. Does not contain mercury or poisonous cyanide. Send \$1 today for large size box. Forest City Sales Co., Fremont, Neb.

BALL & ROLLER BEARINGS, ALL TYPES.

Distributors of "F & S" Ball Bearings. "New Departure" Ball Bearings. "Pressed Steel" Ball Bearings. "Standard" Ball and Roller Bearings. BALL BEARINGS REPAIRED THE GWILLIAM COMPANY. New York—Broadway, at 58th St. Philadelphia—1314 Arch St.

BODIES, FOREDOOR, TOURING RUN—about, \$15.00 to \$50.00. Fenders painted dark blue, \$10.00 set of 4; Selective type 4 speed shifting levers, complete with emergency brake lever, \$8.00. Other bargains. Automobile Appliance Co., 1712 Michigan Ave., Chicago, Ill.

BUICK OWNERS

Why pay two prices for a radiator? We guarantee them when we sell them at

Buick "10," "32" and "33"	\$26.50
Buick "16" and "17"	32.50
Buick "19"	27.50

Write for other makes.

AUTO PARTS MFG. CO.

Detroit, Mich.

CUT-OUTS

E.M.F., Flanders, Buick, Regal, etc. Complete outfit with brass lock, open pedal, \$1.50. Lincoln Machine Shop, Lincoln, Ill. c

PEERLESS BACK & CUSHION DRESSING

Softens the leather and will not crack, wash or rub off. Makes old leather look like new. Dries in twenty minutes. Ask your garage or supply dealer.

The Columbus Varnish Co., Columbus, O.

DETROIT FORE-DOORS

for

E-M-F, Ford and Hudson. One piece aluminum; immediate shipment subject to inspection. Detroit Fore-Door Co.,

564 Porter St., Detroit, Mich

DISCO SELF-STARTERS

For Sale. Only a few. Equip your car with a self-starter for this winter. Guaranteed new stock. List price, \$50; our price, \$12.50. Parsons Sales Co., 1817 Grand, Kansas City.

"DON'T ENVY A SMOOTH RUNNING MOTOR, use Hagstrom Spark Plugs and have one." Write for gas tank key and price list to The Hagstrom Bros. Mfg. Co., Inc., Lindsborg, Kan.

DON'T GET COLD FEET!

Use Our Heater.

For full particulars write to Garrison Gasoline Engine Specialties Co., 251 Richmond Street, Desk 1, Philadelphia, Pa.

DRAGON REPAIR PARTS.

We manufacture and keep on hand all repair parts for the Dragon cars. We make a specialty of repairing this machine. Philadelphia Machine Works, 67 Laurel St., Philadelphia, Pa.

ELECTRIC LIGHTING EQUIPMENT.

We can furnish a complete system for \$36. This outfit consists of one 6-volt, 140-ampere battery, two head lights, two side lights, one tail light, wire for car switch and bulbs. Head lights are 10-inch solid brass with silver plated parabola reflectors, and side lights are 5-inch same material. The Ampvo Battery Co., 1607 Michigan Ave., Chicago, Ill.

E. M. F. PUSH ROD ADJUSTERS \$1.50 for complete set delivered. Money back guarantee. Auto Parts Co., Providence, R. I.

PEERLESS EXTRA FINE BLACK BAKING

Japan. Bakes either to a high gloss finish, egg-shell gloss or dull finish on lamps, radiators and fenders. Will not crack, chip or peel. Ask your garage and supply dealer.

The Columbus Varnish Co., Columbus, O.

FORD AGENTS—WE MAKE A SPECIALTY of Dust Hoods to cover top when clashed down, for Model T Ford 1910-1911-1912-1913 cars. Write for prices. Will save you money. The H. A. Hawes Storm Front Co., Coldwater, Mich.

FORD, BUICK, OVERLAND, E-M-F, MAX-well, Reo, Chalmers, Mitchell, Air-Friction Carburetors, drive your cars three miles per hour on high. Much more speed; much less gas. Our new Model B starts easy in zero weather. Satisfaction or refund money. Air-Friction Carburetor Co., Dayton, Ohio.

FORD, HUPP AND MAXWELL. Muffler cut-out machined ready to attach, including lock, open pedal string and cables, \$1.35. Lincoln Machine Shop, Lincoln, Ill. a

FORD FAN BELTS—WOVEN COTTON and silk; outlasts six regular belts. Post-paid, 75c. Dealers write. Angier's, Sreator, Ill.

FORD OWNERS

A postal brings you our 1912 catalog of 22 necessities for your car. Auto Parts Co., Providence, R. I.

FORD OWNERS AND DEALERS!

You will save trouble and money by installing our timer elevating device. Ford Parts Specialty Co., 1211 Main St., Richmond, Ind.

FORD OWNERS—TOWNSAN VALVE AD-justers will quiet your motor. \$1.50 by mail. Townsan Auto Specialty Co., Mitchell, S. D.

FORD T OWNERS

Foot throttle or accelerators, \$1.50. Lincoln Machine Shop, Lincoln, Ill. a

FORD OWNERS

New guaranteed Ford T radiators \$18, model N-R-&-S. Complete with pump, \$23. Write for other makes.

AUTO PARTS MFG. CO.

Detroit, Mich.

FORE DOORS

Made for all makes of cars. Prompt shipment guaranteed. F. E. Dortz Co., 2503 E. 55th St., Cleveland, O.

FOR SALE—AUTO BODIES, FORE DOOR, new, \$60.00 to \$95.00. Motors, Axles, Auto parts and accessories. Closing out factory stock.

Independence Motors Co.,

Detroit, Mich.

FOR SALE—COUPES FOR IMMEDIATE delivery. Stylish, up-to-date and well constructed. Fit almost any car. Write us. Robbins & Co., Indianapolis, Ind.

FOR SALE—FIVE BRITSON HEAVY car type, steel studded, leather treads, for 34x4 tires. Run less than seventy-five miles. Use larger tires now, sole reason for selling. First \$30 takes them all. V. N. Hansen, Marshalltown, Iowa. v

FOR SALE

Ford Doors for all cars. Overland Detachable Tonneaus Ford Detachable Tonneaus Ford Coupe Bodies Top Delivery Bodies Four-Passenger Bodies Frames and Dashboards 14-gallon Gasoline Tanks Rumble and Surrey Seats Special Seats, Tonneaus and Bodies for all cars. The Metal Body, Tank & Fender Co., Cleveland, Ohio.

FOR SALE—NEW UNIVERSAL DEMOUNTABLE RIMS, 5 to a set complete, \$10; 32x3½; 34x3½; 34x4; 34x4½. Triple Action Spring Co., 215 E. 21st St., Chicago.

FOR SALE—ONE LIMOUSINE BODY FOR Stearns 30-60 chassis. Body cost \$1,750 when new; used one season and in perfect condition. Price, \$800 f. o. b. Louisville. Louisville Lozier Company Louisville, Ky.

FOR SALE

Splitdorf magnetos, new.....\$ 20.00
Four-cylinder Rambler engines..... 100.00
Four-cylinder Continental motor..... 80.00
Four-cylinder 50 H. P. American-British motor..... 200.00
Two-cylinder opposed motor, new... 50.00
Pressed steel frames..... 3.00
Artillery type wood wheels... per set 12.00
Radiators to fit most any car..... 25.00
Send for our 128-page Bargain Sheet.

AUTO PARTS CO.
513-15-17-19-21-23-25-27-29-31 W. Jackson Bl.
Chicago, Ill.

FOR SALE—30 MODEL "38" OVERLAND bodies with detachable tonneau, never been used before, \$15 each. F. E. Lortz Co., 2503 E. 55th St., Cleveland, Ohio.

FRAMES, 34-INCH WIDE—112 W. B. straight, each\$10.00
Frames, 36-inch wide—112 W. B. straight, each 12.00
Frames 36-inch wide—124 W. B. straight, each 14.00
Unassembled frames—Kickup 112-inch W. B., 34-inch wide, each..... 8.00
For assembling each..... 4.00
Wheels—34x3½, 32x3½, 36x4½, per set. 12.00
Axles—40-50 H. P., rear, each...\$45.00 50.00
30-40-50 H. P., front, each..... 12.00
Radiators, 30 H. P., honeycomb, each.. 14.00
Address Box D 169, c/o Motor Age. j

FREE 128-PAGE BARGAIN SHEET

With a list of bargains of nearly everything used in the automobile line. Address at once

AUTO PARTS CO.

513-15-17-19-21-23-25-27-29-31 W. Jackson Bl.
Chicago, Ill.

LIMOUSINE AND LANDAULET BODIES At Reduced Prices.

High grade make and latest styles, will fit any standard chassis. We do mounting, painting, and turn out complete jobs, at a saving of 30 per cent.

Pacific Motor Car Exchange Co.,
229 W. 54th St., New York.

PEERLESS EXTRA FINE BLACK JAPAN.

Covers solid, one coat for enameling lamps, radiators and fenders. No undercoat required. Heat does not affect it. Ask your garage and supply dealer.

The Columbus Varnish Co., Columbus, O.

MAXWELL PUSH ROD ADJUSTERS

\$1.50 for complete set delivered. Money back guarantee. Auto Parts Co., Providence, R. I.

MAXWELL SELF-STARTERS

Prest-O-Lite Tank Starter.

Don't break your back cranking that car when you can get a self-starter made for your car for \$10.

AUTO PARTS MFG. CO.

Detroit, Mich.

METAL BODIES, SEATS, FORD DOORS, radiators, hoods, tanks and fenders. If building a car we can give you the right price. Auto Sheet Metal Works, 2228 Michigan Ave., Chicago.

MORA REPAIR PARTS

We purchased the repair business of the Mora Company, and have in stock repair parts for all models of Mora cars. Philadelphia Machine Works, 67 Laurel St., Philadelphia, Pa.

NEW COUPE BODIES FITTED TO CAR, \$250. Send for photo.

Fred Allen Auto Supply Co.,
1610 Michigan Ave., Chicago, Ill.

NEW SEVEN-PASSENGER LIMOUSINE body, with rear springs and mud guards for model V Stevens-Duryea. C. C. Stoltz, Marlon, Ohio.

NICKEL PLATE YOUR AUTO TRIMMINGS with Electro-Nickel. Prevents brass from tarnishing, iron from rusting. This is not a silver or mercury wash. We guarantee it plates (without a battery). Price \$1.00, express prepaid. Write for information. Gun Metal Finish Co., 313 Powers Bldg., Decatur, Ill.

NEW UNIVERSAL DEMOUNTABLE RIMS, 5 to a set complete, at \$6.00, in sizes of 34x4, 36x4, and 36x4½. Write for our rim part circular. Kastner Tire & Rim Co., 2112 Michigan Ave., Chicago, Ill.

PEERLESS LEATHER TOP DRESSING.

An oil preparation that softens the leather and pantosote. Makes old tops look like new. Ask your garage and supply dealer for it.

The Columbus Varnish Co., Columbus, O.

ONE SET TIMKEN FLOATING AXLES, with hubs, \$65; one 6-cylinder Welch engine and one "Standard Six" at your own price. R. F. Buder, 3321 Shenandoah Ave., St. Louis, Mo.

OXY-ACETYLENE WELDING PLANTS

The Admiral Welding Machine is the ideal welding device; large capacity; self-generating throughout; portable; complete in every detail: a perfect machine for all work, large or small. Send for our booklet, "Welding," and full description. Price, \$200, f. o. b. Kansas City. Admiral Mfg. Co., 715 Lydia Ave., Kansas City, Mo.

PARKINS CARBURETOR. ELECTRIC Horn. Complete Lighting System for Car, Dynamo, Battery, Lamps, Switches, Sockets. Low Prices for Quick Sale. Young, Nyack Ave., Lansdowne, Pa.

PLATE THE BRASS ON YOUR CAR WITH silver. Our preparation deposits pure silver over the surface of brass. With little expense you can keep the brass on your car a bright silver color. Simple to use, applied with a cloth. We also have the best nickel polish on the market. Does not wear the nickel off, but adds to its luster and durability. \$1.00 per bottle. Enough to plate the brass on your car for one year. Agents wanted. Write today.

Re-Plating Co.,
Box 474, Rochester, N. Y.

RADIATORS—NEW GUARANTEED GOODS
Ford Model T.....\$16
Buick Model 10..... 22
Buick Model F..... 25
Chalmers-Detroit..... 20
Everett..... 20
Stoddard-Dayton..... 25
And any other make required at equally low prices.

Times Square Automobile Co.,
1210-1212 Michigan Ave., Chicago.

REPAINT YOUR CAR YOURSELF—WITH our materials and full instructions, you can repaint your car as well as a regular painter and save from \$25 to \$50, depending on its size. Previous experience unnecessary. Latest colors. Write today for full information and color cards. We also make Liquid Gun Metal, the National Brass Enamel, \$1 a can, express prepaid. The only articles of proven merit for lamps, radiators, etc. No polishing. Arsenal Varnish Co., Automobile Dept., Rock Island, Ill.

REPAIR PARTS FOR ANY MAKE CAR AT less than factory prices. Chicago's original gas engine men. Alexander & Cox Co., Ogden and Western Aves., Chicago.

QUICK SALE

Liquidation & Realization Corporation. One lot new Victor Presto Self-Starters. One lot Leader Vulcanizers.

Leader Vulcanizer—We have been fortunate enough to secure for quick realization a large lot of Leader Steam Vulcanizers. Double your tire mileage. Leader Steam Vulcanizer will do it. It is the factory process put into a portable size. You do not have to remove the tire from the rim—can be operated on the road if necessary. Can be carried in your tool box.

This device will reduce your tire expense two-thirds, and you escape the delay of sending tires to the repair shop. Anybody can operate. Original selling price \$15.00 net. Our price for quick sale \$7.50, as long as they last.

Victor Presto Self-Starter—This starter attaches to your Prest-O-Lite tank, and it can be attached by any garage man at an expense of not over three hours at the outside. These starters adopted by 1913 Maxwell and other cars. Were made up for U. S. Motor's car and not delivered owing to receivership. Former list \$35.00—Sale Price \$5.00.

Must be sold—shipments by express, C.O.D. or send draft with order. Above prices good only while the lots last. Money refunded if not satisfactory.

GEO. H. BOWLER, Agent,
511 Hippodrome Bldg., Cleveland, Ohio.

PEERLESS LINING DYE

Dyes the cloth linings of tops and curtains a black, uniform color, covering up water stains and grease spots. Does not wash off. Ask your garage and supply dealer.

The Columbus Varnish Co., Columbus, O.

SAVE WORRY—A PITLESS AUTO TURN-table solves the problem. Catalogues on request. H. I. Forney, 1923 B, Lincoln, Neb.

SEAT COVERS FOR ALL CARS—SPECIAL price on Fords. We clean old covers; make them look like new. Auto Cape Top Co., 2334 Michigan Ave., Chicago.

SHALER TYPE S NO. 22 VULCANIZER complete; like new; used only few times; first check for \$7 takes it. Address C. W. Eader, Shelby, Mich.

SIMPLEST WAY ON EARTH TO TIME valves and spark on automobile and gasoline engines, 25c. D. Strong, Homer, Mich.

TOPS BUILT, RECOVERED AND RE-paired.

C. G. Meyer & Son, Tiffin, Ohio.

WE SELL FOR LESS!!!

Original Mail Order Auto House.

Silk mohair top.....	\$10.00
Side lamps.....	1.75
Head light.....pair	5.00
Tail lamp.....	1.00
All size wheels.....	2.00
Windshield.....	7.50
Speedometer.....	8.00
1-inch carburetor (Puritan).....	1.00
Ford Model T radiator.....	18.00
Ford Model N-S-R radiator.....	23.00
Runabout body.....	30.00
Touring car body, 2-door.....	35.00
Touring car body, 4-door.....	40.00
5-Passenger, 1912 body.....	52.50
Oval gasoline tanks.....	3.75
Buick Model 10 radiator.....	26.00
Bosch magnetos.....	24.00
Splitdorf type magneto and coil.....	22.00
Puritan Machine Co., 51 Tenth St., Detroit, Mich.	

50 H. P. POPE-HARTFORD ENGINE, USED one season, \$175; new U. & H. T. Magnetos, \$25.00; slightly used R. D. Remy Magnetos, with coil, \$30.00; one A No. 3 Stromberg carburetor, like new, \$15.00. Pope-Toledo parts for sale. Auto Salvage and Parts House, 1436 Wabash Ave., Chicago.

For Sale or Exchange

FOR SALE—OR TRADE, ONE STUDE-baker taxicab. Will trade for touring car or roadster. E. B. Collins, 117 West Main St., Danville, Ill.

FOR SALE—250 ONE-TON AUTO EX-press bodies, or will trade for truck and runabout. A. TRAUB, Jackson, Mich.

Auto Wearing Apparel

ATTENTION—HAVE A FEW MANUFACTURER'S samples, gentlemen's black broadcloth fur lined overcoats lined throughout with Australian mink. Large genuine Persian lamb collars, sizes 36 to 48. Value, \$75; will sacrifice for \$35 each. Also several lady's handsome long fur coats, satin lined, worth \$90, while they last, \$35; and a few large size fur robes, plush lined, \$15 each. All guaranteed new. Examine before buying. Send express charges. Will send on approval. Write or call, E. Roberts, Room 6, 160 West 119th St., New York.

Parts and Accessories WANTED

WANTED—Automobile parts and electric accessories to manufacture; large factory; modern machinery and nickel plating plant, operated by skilled mechanics; advice and estimates free. Swedish-Am. Telephone Mfg. Co., 1746 Farragut Ave., Chicago, Ill.

WANTED—SECOND-HAND IRON Planer, 20"x20"x4'. Address F. P. Hish, Tower Hill, Ill.

WE ARE IN THE MARKET FOR JOB lots of all kinds of car parts; complete and incomplete automobiles, new or second-hand, in carload lots. Give particulars and price when writing. The Jones Auto Exchange, Wichita, Kan.

Situations Wanted

COMPETENT FACTORY MAN with extensive electric and automobile manufacturing experience. At present and for the past four years located in Detroit with foremost automobile concern; highly recommended. Qualified to fill any position in the automobile vehicle or parts manufacturing line. Desires to locate with responsible concern in close proximity to New York. Address Box A 1501, Ford Bldg., Detroit, Mich.

CRUDE RUBBER EXPERT A crude rubber man with seven years' experience in inspecting rubber would like a position as rubber buyer for a tire company, or to give expert advice or crude rubber purchases. Address Box D 200, c/o Motor Age. f

EXPERT DEMONSTRATOR AND REPAIR man open for a position first of year as manager or foreman of garage. At present in an up-to-date garage. Eight years' factory and garage experience. Good technical training. If you want a clean, honest man with push and ability, write Box D 189, c/o Motor Age. mc

FOREMAN TRIMMER—A THOROUGHLY competent foreman on all kinds of work, also experienced in handling men, would like to make a change. Is at present employed by large automobile body concern as foreman. High-grade work preferred. Address Box D 199, care Motor Age. r

MANAGER OR DISTRICT SALES MAN-ager is open for engagement (until recently employed by Abbott Motor Co., as District Manager). Have thorough knowledge of both retail and wholesale methods, and acquainted throughout both the Middle and Northwest, also Eastern, territory. Am considered to be a first-class, resourceful business producer. Will guarantee to make good; would consider first-class accessory or tire proposition. Desire connection with first-class house where the services of a high-class man will be appreciated, monetarily and otherwise. Address Box D 216, c/o Motor Age. h

MECHANICAL ENGINEER, 12 YEARS' experience in the designing and manufacture of automobiles, wishes to connect himself with progressive motor truck firm as chief engineer or superintendent. Will be at Chicago Show. Address Box D 229, c/o Motor Age. i

SALESMAN AND DISTRICT MANAGER open for position after January 1; can refer to company am with now for references as to ability. Well acquainted with trade throughout country. Can show unquestionable references. Box D 232, Motor Age. w

Help Wanted

AAA OPEN POSITIONS

With automobile concerns exclusively. Are just as represented, not "catchy ads." All information confidential. If you are a good man, we want you. Write us today. We may have an opening in your city.

We have stood the test for 10 years. An enormous Engineering Department. Get lined up for Jan. 1st.

Designer, \$2500, light car; Works Manager, \$3000-\$5000, axles and parts; Works Manager, \$4000-\$6000, trucks; Lay-Out Man, \$1200, pleasure chassis; Inspector, \$1500-\$1800, machine dept.; Demonstrator, \$1200, engines; Production Man, \$2500; Assembly Demonstrators, \$1200-\$1500; Designer, \$1500, compressors; Designer, \$1500-\$1800, tools and jigs; Designer, \$2500-\$4000, engines; Foreman, \$1500-\$1800, machine shop; Woodwork Foreman, \$1500, bodies; Apprentice Director, \$1800-\$4000, train shop men; Several Bookkeepers, Clerks, and Salesmen; 6 Machinists, 40-45c, lathe, boring mill and dies. Over 50 openings for all kinds shop help, at best wages. Write us immediately. Do it NOW. **BUSINESS MEN'S CLEARING HOUSE,** 323, 108 S. La Salle St., Chicago.

FIRST-CLASS FOREMAN; MAN CAPABLE of running shop employing from ten to twenty men; also must be expert automobile repairman; one hundred miles south of Chicago; references required. Address Box D 233, c/o Motor Age. h

MECHANICAL ENGINEERS, SUPERIN-tendents, works managers and designers wanted. The Engineering Agency, Inc., Monadnock Bldg., Chicago.

PATENT DRAFTSMAN

Wanted—Draftsman having automobile patent drawing experience. Best office in Detroit, good salary and permanent position to right man. Box D 221, c/o Motor Age. p

SALESMAN—ONE WHO IS NOW VISITING automobile trade or owners. Good money made on a very attractive proposition. Sturdy Mfg. Co., 2637 Michigan Ave., Chicago.

WANTED—A FIRST-CLASS RADIATOR and lamp repairman. Bennett Auto Supply Co., Sioux City, Iowa.

WANTED—AN ENERGETIC AUTOMO-bile salesman in each city to introduce an appliance necessary for every automobile. Can be carried in the pocket as a side line when visiting prospects. Active man can make twenty to thirty dollars per day with this device. The Dayton Equipment Co., Dayton, O.

WANTED—EXPERIENCED AUTOMOBILE body draftsman to act in capacity of designer and foreman in high grade, modern body shop. Give full particulars. Position now open. E. J. Thompson Co., Forbes Field, Pittsburgh, Pa.

WANTED—SALESMEN SELLING ACCES-sories on the road to handle our Limousine Heater and gasoline perfect warm mixer as a side line commission; must furnish best of references. United States Manufacturing Co., Troy, N. Y.

3 MECHANICAL DRAFTSMEN ON GASO-line engines or automobile body layout work. \$90-\$125; assistant chief engineer, automobile trucks and motors, \$150, Ohio; chief draftsman near Chicago, automobile and trucks, \$150-\$166, communicate with Mr. Harrison. The Engineering Agency, Inc., Monadnock Block, Chicago.

Radiator and Lamp Repairing

A - A - A RADIATORS MANUFACTURED and repaired. Leaky radiators of any make repaired and returned same day. We can make any style radiator and ship in 3 days. Prices reasonable. Discount to dealers. Sheppard Co., 1331 Jackson Boul., Chicago.

AA1 AUTO LAMP REPAIRING

All Radiators repaired by expert workmen. All work guaranteed by the Michaud Metal Works, 1615 Wabash Ave., Chicago. Tel. Cal. 5286; Auto. 67-337.

ALL KINDS OF AUTO RADIATORS, hoods, fenders and lamps, etc., rebuilt and repaired. Also general sheet metal work. Phone or mail order. L. Blumenfeld & Co., 1919 Wabash Ave., Chicago. Tel. Cal. 4533.

ALL TYPES OF RADIATORS promptly repaired at factory prices. Replacements quickly made with the high-grade direct cooling, cellular type Perflex radiator. All work guaranteed.

Automobile Radiator & Parts Mfg. Co. General office and factory, Racine, Wis.

CHICAGO MANUFACTURING COMPANY 1466 Michigan Ave., Chicago Manufacturers of Radiators, Hoods, Fenders and Tanks. First-class repairing including lamps and windshields. Phone Cal. 4167.

EXPERT REPAIR WORK on Radiators, Hoods, Fenders, Dashes, Tanks and Drip Pans. We guarantee all our work. Arrow Radiator Repair Co., 1331 Wabash Ave., Cal. 1995, Chicago.

ONLY RADIATOR FACTORY IN NORTH-west. Eleven years' knowing how. Why send your Radiator down East when you can ship it to us; save Time, Express, Freight, Money, and get best workmanship. Prices right. Make new Radiators; allow for old one.

Todd Manufacturing Co., 820 Mary Pl., Minneapolis, Minn.

THE M. & L. AUTO SHEET METAL Works rebuild and repair radiators, hoods, fenders, tanks, lamps, etc. 1551 Michigan Ave., Chicago, Ill. Tel. Cal. 2348.

Ignition Repairing

IGNITION AND LIGHTING APPARATUS repaired successfully where others fail. Parts in stock for all makes. Send your next work to us and be convinced. Catalogue sent free. Pellet's Magneto Exchange, 1463 Michigan Ave., Chicago, Ill.

Rebuilding and Repairing

AMERICAN WELDING CO. 2637 Michigan Ave., Chicago. Autogenous welding of all metals, such as crankcases, cylinders, etc. We positively guarantee all work. Tel. Calumet 3563.

ANDRE G. CATELAIN Automobile Garage and General Machine Work For Foreign and American Cars Welding all kinds of metal Manufacturer Catelein Hose Coupling 1446-8 Indiana Ave. Tel. Calumet 1187 Chicago.

AUTOGENOUS WELDING Automobile cylinders and crankcases a specialty. We guarantee the welds. C. Sorensen, 18 East 16th St., Chicago.

AUTOMOBILE CYLINDERS REGROUND, new pistons and rings fitted. Garage Air Compressors. Cast Iron Brazing Co., Manchester, N. H.

BROKEN CRANKSHAFTS, CRANKCASES, cylinders, flywheels, gear teeth, pistons perfectly welded and machined, ready to replace. Scored cylinders made new. Booklet, Atlas Welding Works, Rahway, N. J.

CYLINDERS REBORED, PISTONS AND rings fitted; \$8.00 to \$12.00 per cyl.; gear cutting in nickel steel, rawhide, fiber, brass, etc. Crankshafts, connecting rods, gear sets, axles, crankcases, reproduced like original; send broken or worn parts to go by. The Shop of Quality.

McCadden Machine Works St. Cloud, Minn.

CYLINDERS REGROUND AND FITTED with new pistons and rings from \$7 to \$11 per cylinder. Gear cutting in steel, brass, rawhide, fiber, etc. Send us your old parts and we will make you new ones like originals, often cheaper than you can get them from the manufacturer. The Crown Machine Shop, Crown Point, Ind.

CYLINDERS REGROUND and fitted with new pistons and rings for \$15 per cylinder. We make parts and cut gears of all kinds. Send us your old parts and we will repair or duplicate them in record time. Cracked cylinders, gear cases, etc., welded and made good as new. Aluminum, bronze and brass castings of every description. The Adapt Machinery Co., 1624 Wabash Ave., Chicago, Ill.

FORE DOORS, REPAIRING AND PAINTING; special bodies built to order. High tension Bosch magnetos. Second hand cars and motorcycles. Riverside Garage, 815 W. 30th, Indianapolis, Ind.

SCORED CYLINDERS REPAIRED

No enlargement of bore; no need for new pistons and rings. Send piston with cylinder. Absolutely reliable method. References, testimonials and full details on request. Waterbury Welding Co., Waterbury, Conn.

THE BRAZING AND WELDING CO.

of Chicago
All metals brazed and welded are guaranteed. Experts in aluminum welding. Send for circular on aluminum welding. 1615 Wabash Ave. Tel. Calumet 5286.

WELDING

Cast iron, aluminum and all metals. National Welding & Mfg. Co., Inc., 523 Jackson Blvd., Chicago, Ill.

WELDING

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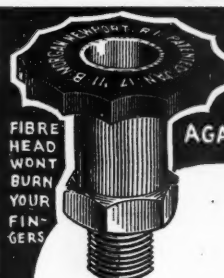
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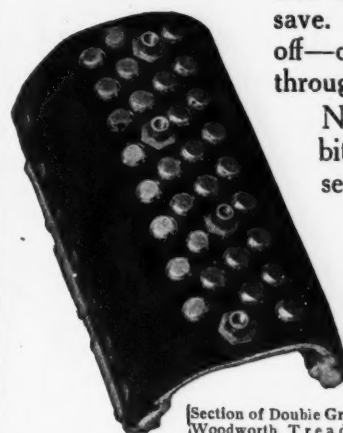
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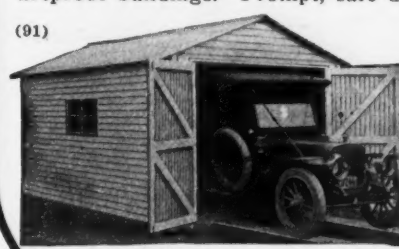
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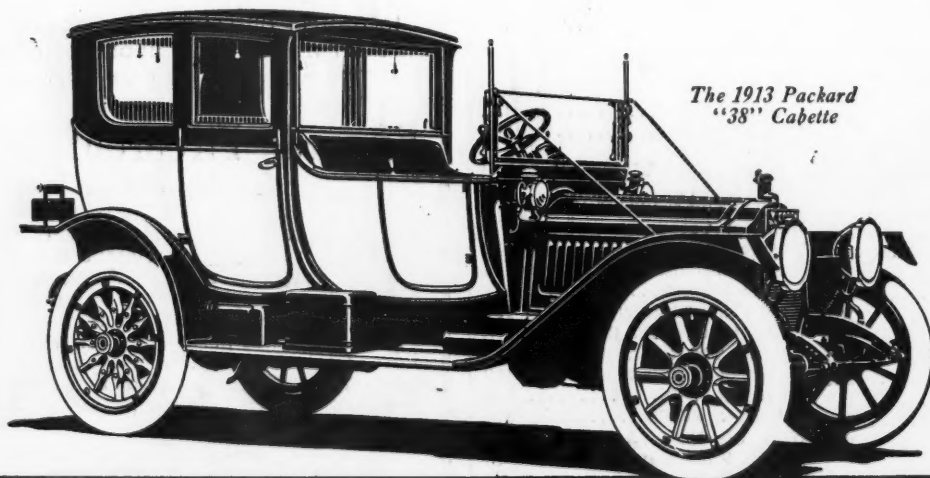
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Consider the prices of cars *only in relation to their quality*. You can pay too little to make a wise investment. You can also pay too much.

Here are some specific facts showing why it is to your interest to pay the Chalmers price rather than lower prices. These same facts show why it is not necessary to pay more than the Chalmers price to get the maximum in motor car service and comfort:

Chalmers transmission gears are ground to an accuracy of $\frac{1}{2}$ of $\frac{1}{1000}$ of an inch, at a cost of \$8 more than unground gears. But grinding means quietness, smoothness, long wear.

The Chalmers crank shaft cost \$6 more than a crank shaft which "would do." But one fact that we are proud of is that we have never had a case of broken crank shaft.

We spend an extra \$15 on each Chalmers body in order to use the best material and the full flush-sided bell-backed design.

None Better than Chalmers

To make Chalmers radiators the best in use we spend \$5 more per radiator than the ordinary type costs.

We could "save" \$10 per car in top material alone but the costlier quality tells in longer wear and better looks. Would require a chemical analysis to tell the difference.

We could buy leather for upholstering \$12 per car cheaper than we actually pay. We spend this difference to secure a high grade, genuine, long-lasting leather.

Compare Chalmers with Others

The Turkish springs in the luxurious Chalmers cushions cost \$3.50 per car more than the ordinary spiral springs used in most medium priced cars.

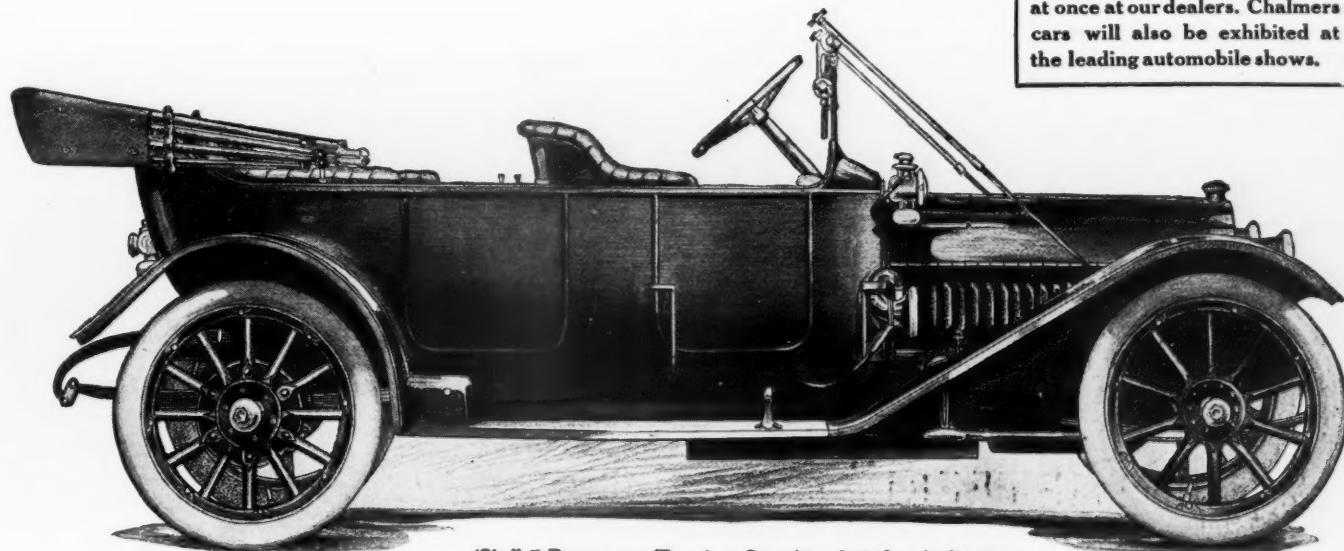
We mention these few items just to show you that we are making no exorbitant claims when we say that Chalmers cars are genuine quality cars at medium prices. We ask you to remember these things in making comparisons.

See the other cars, but do not buy until you have seen the Chalmers. Compare other cars in the Chalmers price class on the points we have named. We are willing to accept your decision after you have made such a comparison.

Our book "Story of the Chalmers Car" sent free on request, will help you in making your choice.

Chalmers Motor Company, Detroit

We urge you to see these cars at once at our dealers. Chalmers cars will also be exhibited at the leading automobile shows.



"Six" 5-Passenger Touring Car, (6 cyl. 54 h. p.) \$2400

"Thirty-Six" (4 cyl. 36 h. p.) 4 or 5 Passenger \$1950

"Six" (6 cyl. 54 h. p.) 7 Passenger \$2600

"30" (4 cyl. 30 h. p.) 4 or 5 Passenger \$1600

(Prices include full equipment and are f. o. b. Detroit.)



ALBRIGHT ART GALLERY, BUFFALO

'13 SIX FIVE-PASSENGER TOURING

THE PEERLESS SIX FOR 1913

IS A SUPERBLY LUXURIOUS & EXCEPTIONALLY
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